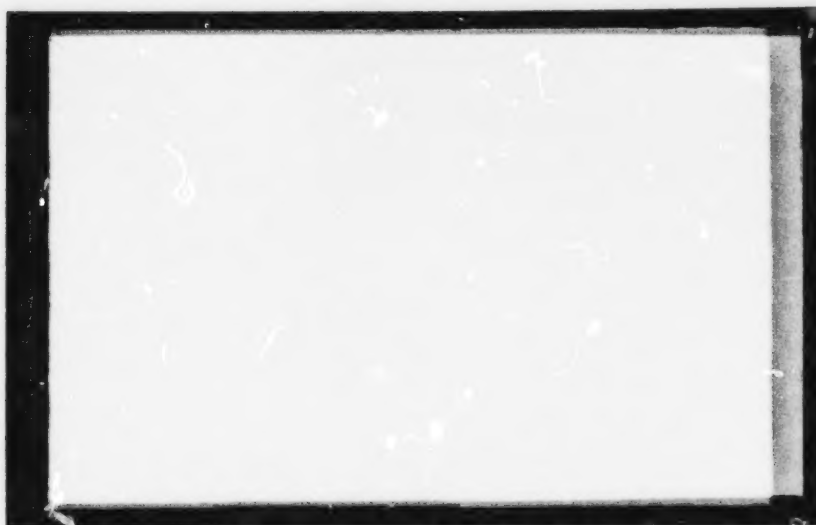


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DSDM PROJECT

L-1 : A PROGRAM FOR BOX-COX TRANSFORMATIONS
IN REGRESSION MODELS WITH HETEROSKEDASTIC
AND AUTOREGRESSIVE RESIDUALS

by

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ABSTRACT

DSDM:L-1 is a program designed to deal with the specification of the functional form in the generalized single-equation regression model when the functional form of heteroscedasticity of the residuals, which may also be autocorrelated, is fully analyzed. As many as 5 different power transformations can be used for the dependent and groups of independent variables, which may be simultaneously modified by a chosen autocorrelation structure of up to 5 autoregressive parameters, and as many as 12 parameters can be associated with the functional form of heteroscedasticity. The asymptotic covariance matrix of all parameter estimates of the system, which includes as many as 29 regression coefficients, is computed.

RÉSUMÉ

Le programme DSDM:L-1 est destiné à l'étude de la forme fonctionnelle du modèle de régression multiple lorsque la forme de l'hétéroscédasticité des erreurs, qui peuvent aussi être autocorrélées, doit aussi être analysée en profondeur. En plus des 29 coefficients de régression considérés, le programme permet de traiter simultanément jusqu'à 6 transformations distinctes de la variable dépendante et de groupes de variables indépendantes, 5 paramètres d'autocorrélation et 12 paramètres associés à la forme de l'hétéroscédasticité des erreurs. La matrice de covariance asymptotique des estimations de tous ces paramètres est calculée.

NOTE

The Direct Spatial Demand by Mode (DSDM) research project comprises the development of various new computer-based analytical transportation planning tools. The procedure described here should be used in models in which the *level* of a particular variable is of interest. Other forthcoming procedures will be centered on the analysis of market *shares*.

REMARQUE

Le projet de recherche sur la Demande Spatiale Directe par Mode (DSDM) porte sur le développement de nouveaux outils informatisés de planification et d'analyse des transports. La procédure décrite ici est applicable aux modèles qui expliquent le *niveau* d'une variable. D'autres procédures d'analyse de *parts* de marché sont en voie de développement.

Marc Gaudry

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I. The Likelihood Function

Consider the following model specified by Gaudry and Dagenais (1978) and summarized in Gaudry and Dagenais (1979) :

$$y_t^{(\lambda_y)} = \sum_k \beta_k X_{kt}^{(\lambda_{xk})} + u_t, \quad (t=1, \dots, n) \quad (1)$$

$$u_t = \sqrt{f(X_t)} v_t, \quad (2)$$

$$v_t = \sum_{\ell=1}^r \rho_\ell v_{t-\ell} + w_t, \quad (3)$$

where $E(v_t^2) = \psi^2$, the r -th autoregressive process is assumed to satisfy standard stationarity assumptions and the w_t are normally and independently distributed with zero mean and covariance matrix $\sigma^{**2} I$.

The functional form for heteroskedasticity is assumed to be:

$$f(X_t) = \begin{cases} \exp \left(\sum_m \delta_m X_{mt}^{(\lambda_{em})} \right) & \text{if } \lambda_u = 0, \\ \left[\lambda_u \left(\delta_o + \sum_m \delta_m X_{mt}^{(\lambda_{em})} \right) + 1 \right]^{1/\lambda_u} > 0 & \text{if } \lambda_u \neq 0, \end{cases} \quad (4)$$

where $y_t^{(\lambda_y)}$, $X_{kt}^{(\lambda_{xk})}$ and $X_{mt}^{(\lambda_{em})}$ are respectively the Box-Cox transforms of y_t , X_{kt} and X_{mt} ; if Z_t denotes y_t , X_{kt} or X_{mt} , the Box-Cox transformation of $Z_t > 0$ is defined for the parameter λ as:

$$Z_t^{(\lambda)} = \begin{cases} \ln Z_t & \text{if } \lambda = 0, \\ (Z_t^\lambda - 1)/\lambda & \text{if } \lambda \neq 0. \end{cases} \quad (5)$$

Note that $f(X_t)$ is in the form of an inverse Box-Cox transformation, and the set of variables X_m may be partly or completely different from the X_k 's group.

The likelihood function associated with this model, when the first r observations are dropped in order to reduce the considerable computational burden which keeping them would have involved, can be expressed as:

$$L = \prod_{t=1+r}^n \frac{1}{\sigma^{**} \sqrt{2\pi}} \frac{y_t^{\lambda_y - 1}}{\sqrt{f(X_t)}} \exp \left\{ - \frac{1}{2\sigma^{**2}} \left(\frac{u_t}{\sqrt{f(X_t)}} - \sum_{l=1}^r \rho_l \frac{u_{t-l}}{\sqrt{f(X_{t-l})}} \right)^2 \right\}, \quad (6)$$

$$\text{where } u_t = y_t^{(\lambda_y)} - \sum_k \beta_k x_{kt}^{(\lambda_{xk})}.$$

The corresponding log-likelihood function is:

$$\begin{aligned} \text{Log } L = & - \frac{n-r}{2} \ln \sigma^{**2} + (\lambda_y - 1) \sum_{t=1+r}^n \ln y_t - \frac{1}{2} \sum_{t=1+r}^n \ln f(X_t) \\ & - \frac{1}{2\sigma^{**2}} \sum_{t=1+r}^n \left(\frac{u_t}{\sqrt{f(X_t)}} - \sum_{l=1}^r \rho_l \frac{u_{t-l}}{\sqrt{f(X_{t-l})}} \right)^2. \end{aligned} \quad (7)$$

Note that whenever a constant term appears in the log-likelihood function, it will be disregarded since it does not interfere at all with the maximization process.

II. The Concentrated Log-likelihood Function

In view of problems involving large numbers of parameters, specially in the fixed part of model (1) — the β_k 's —, the log-likelihood function (7) must be concentrated first on σ^{**2} and then on the β_k 's, in order to reduce the number of parameters directly involved in the maximization

of (7): the remaining parameters to be estimated are ρ , λ_x , λ_y , δ , λ_e , δ_o and λ_u , where the underscripts l , k , m are dropped for ρ , λ_x , δ and λ_e to indicate the corresponding vectors.

Taking the first derivative of (7) with respect to σ^{**2} , yields:

$$\begin{aligned} \frac{\partial \text{Log } L}{\partial \sigma^{**2}} &= -\frac{n-r}{2} \frac{1}{\sigma^{**2}} + \frac{1}{2(\sigma^{**2})^2} \sum_{t=1+r}^n \left(\frac{u_t}{\sqrt{f(X_t)}} - \sum_{l=1}^r \rho_l \frac{u_{t-l}}{\sqrt{f(X_{t-l})}} \right)^2 \\ &= \frac{1}{2\sigma^{**2}} \left[-(n-r) + \frac{1}{\sigma^{**2}} \sum_{t=1+r}^n \left(\frac{u_t}{\sqrt{f(X_t)}} - \sum_{l=1}^r \rho_l \frac{u_{t-l}}{\sqrt{f(X_{t-l})}} \right)^2 \right]. \quad (8) \end{aligned}$$

Setting (8) to zero, we solve for σ^{**2} :

$$\hat{\sigma}^{**2} = \frac{1}{\sum_{t=1+r}^n \left(\frac{u_t}{\sqrt{f(X_t)}} - \sum_{l=1}^r \rho_l \frac{u_{t-l}}{\sqrt{f(X_{t-l})}} \right)^2} / (n-r). \quad (9)$$

Replacing σ^{**2} by its value $\hat{\sigma}^{**2}$ in formula (7), we obtain the log-likelihood function concentrated on σ^{**2} :

$$\text{Log } L^* = -\frac{n-r}{2} \ln \hat{\sigma}^{**2} + (\lambda_y - 1) \sum_{t=1+r}^n \ln y_t - \frac{1}{2} \sum_{t=1+r}^n \ln f(X_t). \quad (10)$$

To concentrate the function (10) on the β_k 's, we must use matrix notation for the expression in (9), which can be rewritten as:

$$\hat{\sigma}^{**2} = \frac{1}{n-r} w'w, \quad (11)$$

where w is a column vector containing the last $n-r$ residuals w_t , ($t=1+r, \dots, n$):

$$w_t = \frac{u_t}{\sqrt{f(X_t)}} - \sum_{l=1}^r \rho_l \frac{u_{t-l}}{\sqrt{f(X_{t-l})}} = y_t^{**} - \sum_k X_{kt}^{**} \beta_k \quad (12)$$

$$\left. \begin{aligned} \text{and } y_t^{**} &= y_t^* - \sum_l \rho_l y_{t-l}^* , \\ X_{kt}^{**} &= X_{kt}^* - \sum_l \rho_l X_{k,t-l}^* , \\ y_t^* &= y_t^{(\lambda)} / \sqrt{f(X_t)} , \\ X_{kt}^* &= X_{kt}^{(\lambda)} / \sqrt{f(X_t)} . \end{aligned} \right\} \quad (13)$$

In terms of the β_k 's, $\hat{\sigma}^{**2}$ can be expressed as:

$$\hat{\sigma}^{**2} = \frac{1}{n-r} (y^{**} - X^{**} \beta)' (y^{**} - X^{**} \beta) , \quad (14)$$

where y^{**} is a column vector containing the last $n-r$ observations on y_t^{**} ; similarly, X^{**} is a $(n-r) \times q$ matrix and β is a q -element column vector.

The first derivative of (10) with respect to vector β is:

$$\begin{aligned} \frac{\partial \text{Log } L^*}{\partial \beta} &= - \frac{n-r}{2} \frac{1}{\hat{\sigma}^{**2}} \frac{\partial \hat{\sigma}^{**2}}{\partial \beta} = - \frac{1}{\hat{\sigma}^{**2}} \left[\frac{\partial (y^{**} - X^{**} \beta)'}{\partial \beta} \right] (y^{**} - X^{**} \beta) \\ &= \frac{1}{\hat{\sigma}^{**2}} X^{**'} (y^{**} - X^{**} \beta) = \frac{1}{\hat{\sigma}^{**2}} (X^{**'} y^{**} - X^{**'} X^{**} \beta) . \end{aligned} \quad (15)$$

Setting (15) to zero, we obtain for β :

$$\hat{\beta} = (X^{**'} X^{**})^{-1} X^{**'} y^{**} . \quad (16)$$

Replacing β by its value $\hat{\beta}$ in the expression (14), we obtain :

$$\hat{\sigma}^{**2} = \frac{1}{n-r} (y^{**} - X^{**} \hat{\beta})' (y^{**} - X^{**} \hat{\beta}) . \quad (17)$$

Finally, the log-likelihood function concentrated on σ^{**2} and β can be written as:

$$\text{Log } L^{**} = -\frac{n-r}{2} \ln \hat{\sigma}^{**2} + (\lambda_y - 1) \sum_{t=1+r}^n \ln y_t - \frac{1}{2} \sum_{t=1+r}^n \ln f(X_t) . \quad (18)$$

III. Program Description

To maximize the function (18) with respect to ρ , λ_x , λ_y , δ , λ_e , δ_0 and λ_u , we use a minimization algorithm due to Fletcher and Powell (1963), a method which requires first derivatives of the function.

The program contains four groups of routines:

- 1) the main program performs the minimization procedure; it comes from the CERN (Centre d'Etudes et de Recherches Nucléaires, near Geneva, Switzerland);
- 2) the log-likelihood function (18) and its derivatives are programmed essentially in SUBROUTINE FCN. The signs of the function and its derivatives are reversed so that we can apply the minimization routine;
- 3) autocorrelation and partial autocorrelation functions for analysis of residuals in terms of the transformed variables (y^{**} , X^{**}) are computed with a group of four subroutines (PDQL, AC, SER, INVERT) programmed at the University of Chicago;
- 4) a group of subroutines from IBM - SSP (Scientific Subroutine Package) is used for matrix manipulations.

The main features of the program can be summarized as follows:

1. for the fixed part of model (1), the independent variables X_k 's can be subdivided into a few groups, each of which contains the X_k 's affected by a common λ_{xk} so as to reduce the number of λ_{xk} 's, which would be otherwise as great as the number of X_k 's. For some of the groups, the λ_{xk} 's can be fixed and for the others, the λ_{xk} 's are to be estimated. Moreover, there is one particular group which is left untouched by the Box-Cox transformation, namely the group containing the constant term, the dummy variables and the ordinary variables which are not strictly positive for all observations;
2. the constraint of type $\lambda_y = \lambda_{x(1)}$ is allowed where 1 represents the 1-th group of X_k 's;
3. in the functional form for heteroskedasticity (4), the δ , λ_e , δ_0 and λ_u can be either fixed or estimated;
4. the initial values for every estimated λ_{xk} and λ_{em} can be set equal to unity. The same is true for λ_y and λ_u when they are estimated;
5. the initial values for δ_0 and every δ_m can be set equal to zero, as well as for the ρ_k 's;
6. the main reason for choosing the initial values set in 4. and 5. is to start with a linear model without considering the problem of autocorrelation and heteroskedasticity;
7. numerically, the transformation $Z_t^{(\lambda)}$ defined in (5) is switched to the form $\ln Z_t$ when $|\lambda| < 10^{-4}$;

8. to avoid numerical problems, all the estimated λ 's are constrained over a region such that $|\lambda| < 20$ (see SUBROUTINE TRANSF) and for the case of heteroskedasticity, when $\lambda_u = 0$, the argument for the exponential defined in (4) is bounded such that $|\sum_m \delta_m X_{mt}^{(\lambda)em}| < 600$ (see SUBROUTINE FCN).

IV. Input Formats

Almost all input is in free format, except for TITREY, Y, TITREX and X which are in user specified format.

card type	input contents
1	80 columns for comments (First column must contain a suitable control carriage character)
2	(ISW(I), I=1, 6), NSTEP, STEP, EPSI
3	NOBS, NC, NF, NM, NB, NRO, NSL, NGF, NGV, NLY, NDM, NLE, NLU, NG
(4)	(L(I), I=1, NRO), (RO(I), I=1, NRO) (if NRO $\neq$ 0)
(5)	(NUMSL(I), I=1, NSL) (if NSL $\neq$ 0)
(6)	(VLXF(I), I=1, NGF)
(7)	NXF(I), (NUMXF(I, J), J=1, NXF(I)) (Repeat for I=1, NGF) } (if NGF $\neq$ 0)
(8)	(VLXV(I), I=1, NGV)
(9)	NXV(I), (NUMXV(I, J), J=1, NXV(I)) (repeat for I=1, NGV) } (if NGV $\neq$ 0)
10	VLY (if NLY = 0 or 1) or NGXY (if NLY = 2), ULY
(11)	ND, (D(I), I=1, ND), (VLE(I), I=1, ND), (NUMX(I), I=1, ND), DZERO, VLU (if NDM $\neq$ -1)
(12)	(NUMG(I), I=1, NG) (if NG $\neq$ 0)
13	(IFMT(I), I=1, 10) (80 columns)
14	TITREY, (Y(I), I=1, NOBS)
15	TITREX(J), (X(I,J), I=1, NOBS) (Repeat for J=1, NB+NM)

NOTE: The card type number in parentheses indicates that the input card is optional and conditional on the control parameter value specified in card type no. 3.

V. Input Parameters

- ISW : output control parameters (see table below).
- NSTEP : maximum number of steps for the run (usually $NSTEP = 500$).
- STEP : magnitude of step for ravine-stepping method. The sign of STEP is immaterial. If STEP is zero, it is set equal to 1 in the program.
- EPSI : convergence parameter for function. If the improvement in function found in 3 consecutive steps is less in absolute value than EPSI, the run is terminated (usually $EPSI = 10^{-7}$).
- NOBS : total number of observations ($NOBS \leq 181$).
- NC : observation number, at the beginning of the estimation period ($1 \leq NC \leq 13$). For a problem with autocorrelation, choose $NC = 1 + \text{highest order of autocorrelation considered}$.
- NF : observation number, at the end of the estimation period ($NF \leq 181$).
- NM : number of X_m 's which do not belong to the X_k 's group ($0 \leq NM \leq 5$).
- NB : number of estimated β_k 's (excluding β_0). ($1 \leq NB \leq 28 - NM$)
- NRO : number of estimated ρ_l 's. ($0 \leq NRO \leq 5$)
- NSL : number of X_k 's not affected by the Box-Cox transformation (excluding the constant). ($0 \leq NSL \leq 20$)
- NGF : number of X_k 's groups having the same fixed λ_{xk} . ($0 \leq NGF \leq 5$)
- NGV : number of X_k 's groups having the same estimated λ_{xk} . ($0 \leq NGV \leq 5$)
- NLY : control parameter for λ_y .
 NLY = 0 : λ_y is fixed throughout the run.
 NLY = 1 : λ_y is estimated.
 NLY = 2 : λ_y is estimated, but is set equal to one of the λ_{xk} 's of the NGV groups.
- NDM : control parameter for the δ_m 's.
 NDM = -1 : no correction for heteroskedasticity (set $NLE = NLU = 0$).
 NDM = 0 : the δ_m 's are fixed. (This case applied only when $NLE = NLU = 0$).
 NDM = 1 : the δ_m 's are estimated.

- NLE : control parameter for the λ_{em} 's.
 NLE = 0 : the λ_{em} 's are fixed.
 NLE = 1 : the λ_{em} 's are estimated.
- NLU : control parameter for λ_u .
 NLU = 0 : λ_u is fixed.
 NLU = 1 : λ_u is estimated.
- NG : number of plots of residuals versus one independent variable with observations ordered by increasing values.
 (0 ≤ NG ≤ 10)
- L : autocorrelation orders associated with the ρ_ℓ 's (in ascending order).
- RO : initial values for the ρ_ℓ 's.
- NUMSL : variable numbers for the X_k 's in the NSL group.
- VLXF : fixed values for the λ_{xk} 's in the NGF groups.
- NXF : number of X_k 's per group, for the NGF groups.
- NUMXF : variable numbers for the X_k 's included in each of the NGF groups.
- VLXV : initial values for the λ_{xk} 's in the NGV groups.
- NXV : number of X_k 's per group, for the NGV groups.
- NUMXV : variable numbers for the X_k 's included in each of the NGV groups.
- VLY : fixed value (if NLY = 0) or initial value (if NLY = 1) for λ_y .
- NGXY : group number for the X_k 's with $\lambda_{xk} = \lambda_y$ (if NLY = 2).
- ULY : upper limit v (before scaling), for the dependent variable y in the computation of $E(y_t)$ when $\lambda_y < 0$ (p. 16). If the user does not want to specify this limit, he simply sets ULY = 0 and a default value of v will be computed.
- ND : number of δ_m 's (excluding δ_0). (0 ≤ ND ≤ 5)
- D : fixed (if NDM = 0) or initial (if NDM = 1) values for δ_m 's.
- VLE : fixed (if NLE = 0) or initial (if NLE = 1) values for λ_{em} 's.
- NUMX : variable numbers for the X_m 's entering in $f(X_t)$.
- DZERO : fixed or initial value of δ_0 , (δ_0 is not used, when NLU = 0 and VLU = 0, but the value of δ_0 must be set to zero).

VLU : fixed (if NLU = 0) or initial (if NLY = 1) value of λ_u .
 NUMG : variable numbers of the independent variables to be plotted against the residuals.
 IFMT : input format within parentheses for TITREY, Y and TITREX, X.
 TITREY : variable name for y.
 Y : observations on y (raw data).
 TITREX : variable name for X_k or X_m .
 X : observations on X_k or X_m (raw data).

NOTE: The program creates automatically the constant which occupies the last position within the set of X_k 's, i.e. the (NB + 1)'th location. The variable numbers for the X_k 's are given by the positions corresponding to the order of appearance of the X_k 's in the set. If there are some X_m 's which do not belong to the X_k 's group ($NM \neq 0$), they must be added at the end of this group, and their corresponding positions (hence, their variable numbers), must be counted as NB + 1 + i (i = 1, NM).

Values of (ISW(I), I=1, 6)

I	Options carried out when ISW(I) = 1
1	Terminates the minimizing procedure at the end of the first step
2	Not used (ISW(2) = 0).
3	Not used (ISW(3) = 0).
4	Not used (ISW(4) = 0).
5	Additional intermediate print-out is produced, describing each new minimum as it is discovered.
6	Not used (ISW(6) = 0).

VI. Description of Output

1) Scaling of Variables:

To avoid numerical problems, a change of scale for y_t , X_{kt} and X_{mt} is performed by using powers of 10 as the scaling factors:

$$Z'_t = Z_t / 10^{[\log_{10} \bar{Z}]}, \quad (19)$$

where Z_t represents y_t , X_{kt} or X_{mt} ; $\bar{Z}$ is the mean of Z , computed only from the subset of positive observations, and $[\log_{10} \bar{Z}]$ is the greatest integer contained in $\log_{10} \bar{Z}$.

2) Elasticity coefficient:

In a demand model context, the elasticity of demand for y with respect to any variable X_k is defined as:

$$\eta_k = \frac{\partial y}{\partial X_k} \frac{X_k}{y}. \quad (20)$$

If $\lambda_y \neq 0$ and $\lambda_{xk} \neq 0$, then:

$$\eta_k = \frac{\partial y}{\partial y} \frac{\partial y^{(\lambda_y)}}{\partial X_k^{(\lambda_{xk})}} \frac{\partial X_k^{(\lambda_{xk})}}{\partial X_k} \frac{X_k}{y},$$

$$\eta_k = \frac{1}{\lambda_y - 1} \beta_k X_k^{\lambda_{xk} - 1} \frac{X_k}{y} = \beta_k \frac{X_k^{\lambda_{xk}}}{\lambda_y y}, \quad (21)$$

which is a special case of the elasticities derived in Gaudry and Wills (1978).

The elasticity of demand evaluated at the mean values of y and X_k (i.e. at $\bar{y}$ and $\bar{X}_k$) is given in the program:

$$\bar{\eta}_k = \beta_k \frac{\bar{x}_k \lambda_{xk}}{\bar{y} \lambda_y} \quad (22)$$

Note that $\bar{\eta}_k = \beta_k$ when $\lambda_{xk} = \lambda_y = 0$.

3) Measures of the Coefficient of Determination

Two measures of R^2 are computed in the program.

a) R^2 in terms of y^{**} and $\hat{y}^{**} = X^{**} \hat{\beta}$:

$$R^2 = 1 - \frac{\sum_{t=1+r}^n (y_t^{**} - \hat{y}_t^{**})^2}{\sum_{t=1+r}^n (y_t^{**} - \bar{y}^{**})^2} \quad (23)$$

where $\bar{y}^{**}$ is the mean of y_t^{**} , and $\hat{\beta}$ is defined as in (16).

b) Pseudo-(L) - R^2 :

$$R_L^2 = 1 - \Lambda^{2/N} \quad (24)$$

where $N = n - r$ and $\Lambda = \max_{p \in \omega} L(p) / \max_{p \in \Omega} L(p)$ is the ratio of two maximum

likelihood functions, one corresponding to the region ω in the parameter space Ω , specified under the null hypothesis $H : \tilde{\beta} = 0$ for the linear case without autocorrelation and heteroscedasticity ($\tilde{\beta}$ is the regression coefficient vector containing the elements of β , except the coefficient for the constant term), and the other associated with the more or less restricted parameter space Ω for $\rho = (\beta, \rho, \lambda_x, \lambda_y, \delta, \lambda_e, \delta_o, \lambda_u, \sigma^{**2})'$.

An explicit form of $\Lambda^{2/N}$ in terms of y_t and y_t^{**} can be obtained:

$$\Lambda^{2/N} = \frac{\sum_{t=1+r}^n (y_t^{**} - \hat{y}_t^{**})^2}{\sum_{t=1+r}^n (y_t - \bar{y})^2} \left\{ \prod_{t=1+r}^n [y_t^{\lambda_y - 1} / \sqrt{f(X_t)}] \right\}^{-2/N} \quad (25)$$

It is readily seen that the measure R_L^2 will be identical to the conventional R^2 in the classical linear regression case without autocorrelation and heteroscedasticity, when the parameter space Ω is reduced to $p = (\beta, \sigma^{**2})$.

4) Expected Values of the Dependent Variable:

a) Transformed Variable (y^{**})

Since the Box-Cox transformation applies only to strictly positive variables, and in particular for the dependent variable y_t , it will be convenient to assume for the moment that $\epsilon \leq y_t \leq v$, where ϵ is an arbitrary small positive number and v is the upper limit of y_t .

Following (12) and (13), we can write:

$$y_t^{**} = \sum_k X_{kt}^{**} \beta_k + w_t = \frac{\lambda_y y_t - 1}{\lambda_y \sqrt{f(X_t)}} - \sum_l \rho_l y_{t-l}^* \quad (26)$$

The above assumption for y_t implies that:

$$\frac{\epsilon \lambda_y - 1}{\lambda_y \sqrt{f(X_t)}} - \sum_l \rho_l y_{t-l}^* \leq y_t^{**} \leq \frac{v \lambda_y - 1}{\lambda_y \sqrt{f(X_t)}} - \sum_l \rho_l y_{t-l}^*, \quad (\lambda_y > 0) \quad (27.a)$$

and

$$\frac{1/\epsilon |\lambda_y| - 1}{\lambda_y \sqrt{f(X_t)}} - \sum_l \rho_l y_{t-l}^* \leq y_t^{**} \leq \frac{1/v |\lambda_y| - 1}{\lambda_y \sqrt{f(X_t)}} - \sum_l \rho_l y_{t-l}^*, \quad (\lambda_y < 0) \quad (27.b)$$

Relaxing the assumption ($\epsilon \rightarrow 0$ and $v \rightarrow \infty$), we obtain:

$$\left\{ \begin{array}{l} \tilde{y}_t^{**} \leq y_t^{**} < \infty, \quad (\lambda_y > 0) \end{array} \right. \quad (28.a)$$

$$\left\{ \begin{array}{l} -\infty < y_t^{**} \leq \tilde{y}_t^{**}, \quad (\lambda_y < 0) \end{array} \right. \quad (28.b)$$

where $\tilde{y}_t^{**} = -\frac{1}{\lambda_y \sqrt{f(X_t)}} - \sum_l \rho_l y_{t-l}^*$.

The expected value of y_t^{**} can then be expressed as:

$$E(y_t^{**}) = \begin{cases} \tilde{y}_t^{**} \int_{-\infty}^{\tilde{w}_t^{**}} f(w) dw + \int_{\tilde{w}_t^{**}}^{\infty} (\sum_k X_{kt}^{**} \beta_k + w) f(w) dw , & (\lambda_y > 0) \\ \int_{-\infty}^{\tilde{w}_t^{**}} (\sum_k X_{kt}^{**} \beta_k + w) f(w) dw + \tilde{y}_t^{**} \int_{\tilde{w}_t^{**}}^{\infty} f(w) dw , & (\lambda_y < 0) \end{cases} \quad (29)$$

where

$$\tilde{w}_t^{**} = \tilde{y}_t^{**} - \sum_k X_{kt}^{**} \beta_k \quad \text{and} \quad f(w) = (2\pi \sigma^{**2})^{-1/2} \exp(-w^2/2\sigma^{**2}) .$$

When $\lambda_y = 0$, it is readily seen that $-\infty < y_t^{**} < \infty$ and we have:

$$E(y_t^{**}) = \int_{-\infty}^{\infty} (\sum_k X_{kt}^{**} \beta_k + w) f(w) dw . \quad (30)$$

Note that $E(y_t^{**})$ can also be computed as:

$$E(y_t^{**}) = \tilde{y}_t^{**} + E(w_t) \quad (31)$$

where

$$E(w_t) = \begin{cases} \tilde{w}_t^{**} \int_{-\infty}^{\tilde{w}_t^{**}} f(w) dw + \int_{\tilde{w}_t^{**}}^{\infty} w f(w) dw , & (\lambda_y > 0) \\ 0 , & (\lambda_y = 0) \\ \int_{-\infty}^{\tilde{w}_t^{**}} w f(w) dw + \tilde{w}_t^{**} \int_{\tilde{w}_t^{**}}^{\infty} f(w) dw , & (\lambda_y < 0) \end{cases}$$

b) Original Variable (y)

Reassuming that $\epsilon \leq y_t \leq v$ and extending Tobin's (1958) formula to a doubly censored dependent variable [Dagenais, Gaudry and Liem (1980)], the expected value of y_t can be written as follows:

$$E(y_t) = \epsilon \int_{-\infty}^{w_t(\epsilon)} f(w) dw + \int_{w_t(\epsilon)}^{w_t(v)} y_t(w) f(w) dw + v \int_{w_t(v)}^{\infty} f(w) dw \quad (32)$$

where

$$w_t(\xi) = \begin{cases} \frac{\frac{\lambda_y}{\lambda_y - 1} - \sum_l \rho_l y_{t-l}^* - \sum_k X_{kt}^{**} \beta_k}{\lambda_y \sqrt{f(X_t)}} & , \quad (\lambda_y \neq 0) \\ \frac{\ln(\xi)}{\sqrt{f(X_t)}} - \sum_l \rho_l \frac{\ln(y_{t-l})}{\sqrt{f(X_{t-l})}} - \sum_k X_{kt}^{**} \beta_k & , \quad (\lambda_y = 0) \end{cases}$$

and

$$y_t(w) = \begin{cases} [1 + \lambda_y \sqrt{f(X_t)} (\sum_l \rho_l y_{t-l}^* + \sum_k X_{kt}^{**} \beta_k + w)]^{1/\lambda_y} & , \quad (\lambda_y \neq 0) \\ \exp [\sqrt{f(X_t)} (\sum_l \rho_l \frac{\ln(y_{t-l})}{\sqrt{f(X_{t-l})}} + \sum_k X_{kt}^{**} \beta_k + w)] & , \quad (\lambda_y = 0) . \end{cases}$$

When $\lambda_y > 0$, as $\epsilon \rightarrow 0$ and $v \rightarrow \infty$, the first and last terms on the RHS of (32) vanish and the expression reduces to:

$$E(y_t) = \int_{\tilde{w}_t^{**}}^{\infty} y_t(w) f(w) dw \quad . \quad (33)$$

For the case $\lambda_y = 0$, the expression (32) can be simplified in the same way, as $\epsilon \rightarrow 0$ and $v \rightarrow \infty$:

$$E(y_t) = \int_{-\infty}^{\infty} y_t(w) f(w) dw \quad . \quad (34)$$

When $\lambda_y < 0$, as $\varepsilon \rightarrow 0$, $w_t(\varepsilon) \rightarrow -\infty$ and the first term on the RHS of (32) disappears:

$$E(y_t) = \int_{-\infty}^{w_t(v)} y_t(w) f(w) dw + v \int_{w_t(v)}^{\infty} f(w) dw \quad . \quad (35)$$

If we let now v tend to infinity, then $w_t(v) \rightarrow \tilde{w}_t^{**}$ and $E(y_t)$ does not have any finite value. In that case, the experimenter is asked to supply a reasonable value of v for which $E(y_t)$ can be computed. If the value of v is not specified, the program will generate a default value which is set as follows:

$$v = \min [\max (y_t) + 10 \sigma_y , (- 0.8 \sigma_y^{**} \lambda_y)^{1/\lambda_y}] \quad , \quad (36)$$

where σ_y is the sample standard error of y_t .

5) Analysis of Residuals with Autocorrelation and Partial Autocorrelation Functions

At the initial and final stages of the maximization of $\text{Log } L^{**}$ given in (18), autocorrelation and partial autocorrelation functions are evaluated for the residual term w_t defined in (12).

Following the notation of Box-Jenkins (1976), a differencing operation is first applied to the series w_t :

$$\tilde{w}_t = (1 - B)^d (1 - B^s)^D w_t, \quad (t=1+r, \dots, n) \quad (37)$$

where B is the backward shift operator defined by $Bw_t = w_{t-1}$, hence $B^m w_t = w_{t-m}$, d is the degree of consecutive differencing, D is the degree of seasonal differencing and s is the period of seasonal differencing.

The following values are printed out:

a) autocorrelation function:

$$r_k = c_k / c_0, \quad k=0, 1, \dots, K, \quad (38)$$

where c_k is the autocovariance function of lag k :

$$c_k = \sum_{t=1+r}^{n-k} (\tilde{w}_t - \bar{\tilde{w}}) (\tilde{w}_{t+k} - \bar{\tilde{w}}) / (n-r), \quad (39)$$

$\bar{\tilde{w}}$ is the mean of $\tilde{w}_t$ and K is the maximum lag of autocovariance and autocorrelation functions. Note that c_0 is the variance of $\tilde{w}_t$.

b) partial autocorrelation function:

$$\hat{\phi}_{\ell\ell} = \begin{cases} r_1, & \text{for } \ell=1, \\ \frac{r_\ell - \sum_{j=1}^{\ell-1} \hat{\phi}_{\ell-1,j} r_{\ell-j}}{1 - \sum_{j=1}^{\ell-1} \hat{\phi}_{\ell-1,j} r_j}, & \ell=2,3,\dots,L, \end{cases} \quad (40)$$

where L is the maximum lag of partial autocorrelation function, and

$$\hat{\phi}_{\ell j} = \hat{\phi}_{\ell-1,j} - \hat{\phi}_{\ell\ell} \hat{\phi}_{\ell-1,\ell-j}, \quad j=1,2,\dots,\ell-1.$$

c) estimated standard errors for the autocorrelations and partial autocorrelations are printed next to each row of output and apply to all entries in that row.

Both consecutive and seasonal differencing may be applied more than once or together to produce higher order differences. In the program, the fixed values of d , D , s , K , and L are respectively 1, 1, 12, 60, 12; the user may wish to change this. The allowed ranges for d , D , s , K and L are:

$$0 \leq d \leq 3, \quad 0 \leq D \leq 3, \quad 0 \leq s \leq 12, \quad d + sD \leq n-r,$$

$$\text{and } 1 \leq K \leq 100, \quad 1 \leq L \leq 12, \quad K \geq L.$$

6) Plot of Residuals Against One Independent Variable

At the initial and final steps of the maximization process, the estimated residuals of w_t are plotted against one selected independent variable, the observations of which are ordered by increasing values, to

provide a partial analysis of the functional form of heteroskedasticity related to this variable.

The residuals are plotted to scale on the horizontal axis, whereas on the vertical axis, the independent variable is not, due to the length of the series: one line skipping represents an observation, independently of the value of the observation.

7) Change of Parameter Space

During the maximization procedure for $\text{Log } L^{**}$, a constraint on each parameter ρ_ℓ ($\ell=1, \dots, r$) is introduced implicitly by a change of space for ρ_ℓ ; we use the Fisher's z-transformation which is defined as:

$$z_\ell = \frac{1}{2} \ln \frac{1 + \rho_\ell}{1 - \rho_\ell}, \quad -1 < \rho_\ell < 1 \quad \text{and} \quad -\infty < z_\ell < +\infty. \quad (41)$$

In other words, we have changed a maximization problem with constraints into one without constraints: the output parameter values between iterations are thus in terms of z , λ_x , λ_y , δ , λ_e , δ_o and λ_u . Note that the inverse transformation of (41) is $\rho_\ell = \tanh z_\ell$.

8) Likelihood Ratio Test

At the end of the maximization process, a likelihood ratio test is performed by computing the following statistic:

$$-2 (\text{Log } L_o^{**} - \text{Log } L_1^{**}) , \quad (42)$$

which is distributed asymptotically as χ^2 , with degrees of freedom equal to the difference in the numbers of parameters involved in the two models, where L_o^{**} is the maximum of the likelihood function associated with the

initial model (at the beginning of the iterations) and L_1^{**} is the maximum of the likelihood function associated with the final model (at the end of the iterations).

9) Asymptotic Covariance Matrix for the Parameters

To compute the asymptotic covariance matrix for the parameters $\beta, \rho, \lambda_x, \lambda_y, \delta, \lambda_e, \delta_o, \lambda_u$ and σ^{**2} at the maximum point of the likelihood function, we use the fundamental statistical relation that the asymptotic covariance matrix of a maximum likelihood estimator is equal to the inverse of the covariance matrix of the gradient of the likelihood function (Kendall and Stuart, p. 55, vol. II (1967); for an application of the theorem in a nonlinear structural model, see Berndt, Hall and al. (1974)).

The gradient of the log-likelihood function (7) can be written as:

$$\frac{\partial \text{Log } L}{\partial p_i} = \sum_{t=1+r}^n D_{t,i}, \quad (43)$$

where p_i represents a typical element of $\beta, \rho, \lambda_x, \lambda_y, \delta, \lambda_e, \delta_o, \lambda_u$ and σ^{**2} ; $D_{t,i}$ is defined as:

$$D_{t,i} = \begin{cases} \frac{\partial(\lambda_y - 1)}{\partial p_i} \ln y_t - \frac{1}{2} \frac{\partial \ln f(x_t)}{\partial p_i} - \frac{w_t}{\sigma^{**2}} \frac{\partial w_t}{\partial p_i} & \text{if } p_i \neq \sigma^{**2} \\ \left(\frac{w_t^2}{\sigma^{**2}} - 1 \right) / 2\sigma^{**2} & \text{if } p_i = \sigma^{**2} \end{cases} \quad (44)$$

At the maximum of the log-likelihood function, the asymptotic covariance matrix of the parameters is estimated by:

$$\text{COV} = \left[\begin{array}{cc} n & \\ \sum_{t=1+r} & D_t D_t' \end{array} \right]^{-1}, \quad (45)$$

where D_t is a column vector with $D_{t,1}$ as a typical element. Note that the covariance matrix is output in a lower triangular form.

The different derivatives involved in the expression for $D_{t,1}$, when $p_1 \neq \sigma^{**2}$, are given below.

$$\frac{\partial(\lambda_y - 1)}{\partial p_1} = \begin{cases} 0 & \text{if } p_1 \neq \lambda_y \\ 1 & \text{if } p_1 = \lambda_y \end{cases}$$

p_1	$\partial w_t / \partial p_1$
β_k	$- X_{kt}^{**}$
ρ_ℓ	$-(y_{t-\ell}^* - \sum_k X_{k,t-\ell}^* \beta_k)$
λ_{xk}	$\left\{ \begin{array}{l} -\frac{\beta_k}{\lambda_{xk}} \left[\frac{X_{kt}^{\lambda_{xk}} \ln X_{kt}}{\sqrt{f(X_t)}} - \sum_\ell \rho_\ell \frac{X_{k,t-\ell}^{\lambda_{xk}} \ln (X_{k,t-\ell})}{\sqrt{f(X_{t-\ell})}} - X_{kt}^{**} \right] \quad \text{for } \lambda_{xk} \neq 0 \\ -\frac{1}{2} \beta_k \left[\frac{(\ln X_{kt})^2}{\sqrt{f(X_t)}} - \sum_\ell \rho_\ell \frac{(\ln X_{k,t-\ell})^2}{\sqrt{f(X_{t-\ell})}} \right] \quad \text{for } \lambda_{xk} = 0 \end{array} \right.$

$$\lambda_y \left\{ \begin{array}{ll} -\frac{1}{\lambda_y} \left[y_t^{**} - \frac{y_t^y \ln y_t}{\sqrt{f(X_t)}} + \sum_{\ell} \rho_{\ell} \frac{y_{t-\ell}^y \ln (y_{t-\ell})}{\sqrt{f(X_{t-\ell})}} \right] & \text{for } \lambda_y \neq 0 \\ \frac{1}{2} \left[\frac{(\ln y_t)^2}{\sqrt{f(X_t)}} - \sum_{\ell} \rho_{\ell} \frac{(\ln y_{t-\ell})^2}{\sqrt{f(X_{t-\ell})}} \right] & \text{for } \lambda_y = 0 \end{array} \right.$$

$$\delta_m - \frac{1}{2} \left[(y_t^* - \sum_k X_{kt}^* \beta_k) \frac{X_{mt}^{(\lambda_{em})}}{[f(X_t)]^{\lambda_u}} - \sum_{\ell} \rho_{\ell} (y_{t-\ell}^* - \sum_k X_{k,t-\ell}^* \beta_k) \frac{X_{m,t-\ell}^{(\lambda_{em})}}{[f(X_{t-\ell})]^{\lambda_u}} \right]$$

$$\lambda_{em} \left\{ \begin{array}{ll} -\frac{1}{2} \left[(y_t^* - \sum_k X_{kt}^* \beta_k) \frac{X_{mt}^{(\lambda_{em})} \ln X_{mt} - X_{mt}^{(\lambda_{em})}}{[f(X_t)]^{\lambda_u}} \right. \\ \left. - \sum_{\ell} \rho_{\ell} (y_{t-\ell}^* - \sum_k X_{k,t-\ell}^* \beta_k) \frac{X_{m,t-\ell}^{(\lambda_{em})} \ln X_{m,t-\ell} - X_{m,t-\ell}^{(\lambda_{em})}}{[f(X_{t-\ell})]^{\lambda_u}} \right] \frac{\delta_m}{\lambda_{em}} & \text{for } \lambda_{em} \neq 0 \\ -\frac{1}{4} \delta_m \left[(y_t^* - \sum_k X_{kt}^* \beta_k) \frac{(\ln X_{mt})^2}{[f(X_t)]^{\lambda_u}} \right. \\ \left. - \sum_{\ell} \rho_{\ell} (y_{t-\ell}^* - \sum_k X_{k,t-\ell}^* \beta_k) \frac{(\ln X_{m,t-\ell})^2}{[f(X_{t-\ell})]^{\lambda_u}} \right] & \text{for } \lambda_{em} = 0 \end{array} \right.$$

$$\begin{array}{l}
 \delta_o \quad - \frac{1}{2} (y_t^* - \sum_k X_{kt}^* \beta_k) \frac{1}{[f(X_t)]^{\lambda_u}} - \sum_l \rho_l (y_{t-l}^* - \sum_k X_{k,t-l}^* \beta_k) \frac{1}{[f(X_{t-l})]^{\lambda_u}} \\
 \left\{ \begin{array}{l}
 - \frac{1}{2} \left[(y_t^* - \sum_k X_{kt}^* \beta_k) \left(\frac{\delta_o + \sum_m \delta_m X_{mt}^{(\lambda_{em})}}{[f(X_t)]^{\lambda_u}} - \ln f(X_t) \right) \right. \\
 \left. - \sum_l \rho_l (y_{t-l}^* - \sum_k X_{k,t-l}^* \beta_k) \left(\frac{\delta_o + \sum_m \delta_m X_{m,t-l}^{(\lambda_{em})}}{[f(X_{t-l})]^{\lambda_u}} - \ln f(X_{t-l}) \right) \right] \frac{1}{\lambda_u} \\
 0
 \end{array} \right.
 \end{array}$$

for $\lambda_u \neq 0$

for $\lambda_u = 0$

p_1	$\partial \ln f(X_t) / \partial p_1$
β_k	0
ρ_ℓ	0
λ_{xk}	0
λ_y	0
δ_m	$X_{mt}^{(\lambda_{em})} / [f(X_t)]^{\lambda_u}$
λ_{em}	$\left\{ \begin{array}{ll} \frac{\delta_m}{\lambda_{em}} (X_{mt}^{\lambda_{em}} \ln X_{mt} - X_{mt}^{(\lambda_{em})}) / [f(X_t)]^{\lambda_u} & \text{for } \lambda_{em} \neq 0 \\ \frac{1}{2} \delta_m (\ln X_{mt})^2 / [f(X_t)]^{\lambda_u} & \text{for } \lambda_{em} = 0 \end{array} \right.$
δ_o	$1 / [f(X_t)]^{\lambda_u}$
λ_u	$\left\{ \begin{array}{ll} \frac{1}{\lambda_u} \left[\frac{\delta_o + \sum_m \delta_m X_{mt}^{(\lambda_{em})}}{[f(X_t)]^{\lambda_u}} - \ln f(X_t) \right] & \text{for } \lambda_u \neq 0 \\ 0 & \text{for } \lambda_u = 0 \end{array} \right.$

NOTE: The derivatives for the case $\lambda = 0$ are actually computed for very small values of λ , say $|\lambda| < 10^{-4}$.

10) Correlation Matrices

A correlation matrix for the independent variables (excluding the constant) and the dependent variable in terms of the original variables (X and y) is always given before the maximization procedure begins. Another correlation matrix in terms of the transformed variables (X** and y**) is finally computed at the maximum of the log-likelihood function.

The matrices are stored and output in a lower triangular form, where the last row represents the pairwise correlations between each of the independent variables and the dependent variable.

11) Student-t Statistics

In the final table where the estimated values of the parameters (β , ρ , λ_x , λ_y , δ , λ_e , δ_o , λ_u) are reported, the t-tests are computed under the hypothesis that the parameter is equal to zero. For λ_x , λ_y , λ_e and λ_u , an additional t-test (given in the second row for each entry of λ) is performed under the hypothesis that the parameter is equal to one.

VII. Sample Deck Structure and Print-out

The sample deck given below illustrates a model with:

- 1) a dependent variable $y = \text{XCANFA}$;
- 2) and twenty-six independent variables $X_1 = \text{FAD}, \dots, X_{26} = \text{ANTL1}$
(the constant term, generated in the program itself, is defined as $X_{27} = \text{CONSTANT}$).

The NSL group includes fourteen independent variables: $X_8, \dots, X_{11}, X_{13}, X_{15}, \dots, X_{21}, X_{25}, X_{26}$. By convention, X_{27} needs not to be declared as pertaining to the NSL group: it is automatically assigned to this group.

There are five NGV groups:

- 1) the first contains X_1 , X_2 and X_3 with a common $\lambda_{x(1)}$,
- 2) the second: X_4 with $\lambda_{x(2)}$,
- 3) the third: X_5 , X_6 and X_7 with a common $\lambda_{x(3)}$,
- 4) the fourth: X_{12} and X_{14} with a common $\lambda_{x(4)}$,
- 5) the fifth: X_{22} , X_{23} and X_{24} with a common $\lambda_{x(5)}$.

For the dependent variable y , there is one λ_y to be estimated separately along with the λ_x .

The autocorrelation structure of first and twelfth orders is considered. For the heteroskedasticity case, there is only one independent variable, $X_{14} = \text{SHONF}$, involved in $f(X_t)$ with the case $\lambda_u = 0$. A plot of residuals against X_{14} is also performed.

SAMPLE DECK STRUCTURE

(as executed on a CDC-CYBER-173,
at the University of Montreal)

CONTROL
STATEMENTS

L49TC,CM130000,T700.

*CODE

FTN.

SSPFTN.

LGO(PL=20000)

*WEOR

FORTRAN
SOURCE
DECK

*WEOR

_AUTOCORRELATION AND HETEROSKEDASTICITY, FIVE GROUPS OF LAMBDA (X)

0_0_0_0_1_0_500_1_.1.E-7

181_13_181_0_26_2_14_0_5_1_1_0_1

1_12_0_.0.

8_9_10_11_13_15_16_17_18_19_20_21_25_26

1_.1_.1_.1_.1.

3_1_2_3

1_4

DATA

3_5_6_7

2_12_14

3_22_23_24

1_.0.

1_0_.1_.14_0_.0.

14

(3XA8,54XE15.7/(20X4E15.7))

Variable name and observations for y = XCANFA

Variable name and observations for X₁ = FAD

⋮
⋮
⋮

Variable name and observations for X₂₆ = ANTL1

NOTE: In a free format (i.e. without a FORMAT statement), input/output data consist of a string of values separated by at least one blank (the symbol _ represents one blank). If this type of format is not available on some computers, one can easily change it into a formatted input/output (see Main program and subroutine FCN for modifications).

PRINT-OUT

ISW,NSTEP,STEP,EPSI 0 0 0 0 1 0 500 1. 1.E-7
NOBS,NC,NF,NM,NB 181 13 181 0 26
NRO,NSL,NGF,NGV,NLY 2 14 0 5 1
NDM,NLE,NLU,NG 1 1 0 1

AUTOCORRELATION OF ORDERS 1 12
INITIAL VALUES FOR RHOS 0. 0.

GROUP (X) WITHOUT BOX-COX TRANSFORMATION 8 9 10 11 13 15 16 17 18 19 20 21 25 26

GROUP 1 INITIAL VALUE FOR LAMBDA(X) 1.
VARIABLE NO. 1 2 3

GROUP 2 INITIAL VALUE FOR LAMBDA(X) 1.
VARIABLE NO. 4

GROUP 3 INITIAL VALUE FOR LAMBDA(X) 1.
VARIABLE NO. 5 6 7

GROUP 4 INITIAL VALUE FOR LAMBDA(X) 1.
VARIABLE NO. 12 14

GROUP 5 INITIAL VALUE FOR LAMBDA(X) 1.
VARIABLE NO. 22 23 24

INITIAL VALUE FOR LAMBDA(Y) 1.
UPPER LIMIT FOR Y 0.

HETEROSCEDASTICITY
INITIAL VALUES FOR DELTAS 0.
INITIAL VALUES FOR LAMBDA(S(E)) 1.
VARIABLE NO. 14
FIXED VALUES FOR DELTA(ZERO) AND LAMBDA(U) 0. 0.

MEANS OF ORIGINAL VARIABLES COMPUTED FROM THE SUBSET OF POSITIVE OBSERVATIONS		NUMBER OF POSITIVE OBSERVATIONS	SCALING FACTORS (POWERS OF 10)
XCANFA	.2033392E+08	181	7
1 FAD	.1634673E+00	181	0
2 NC	.3048819E+06	181	5
3 P	.1393585E+03	181	2
4 RAVEM	.7874157E+02	181	1
5 TV	.3919595E+01	181	0
6 TT	.2147617E+02	181	1
7 T2T	.1001378E+02	181	1
8 TLK	.1946111E+03	170	2
9 KTK	.7225757E+00	179	0
10 SPK	.4913224E+01	96	0
11 CSFMR	.4655368E+02	95	1
12 EAHFP	.1241095E+09	181	9
13 RCUTP	.2384263E+05	172	4
14 S-ONF	.2059588E+06	181	5
15 EX7	.2611922E+07	7	6
16 EX8	.6866020E+05	6	5
17 EX9	.5944373E+06	4	5
18 EX0	.545238E+06	4	5
19 EX1	.4598918E+06	4	5
20 STR	.1466667E+02	3	1
21 ZA	.8039551E-01	109	-1
22 WD	.2081766E+02	181	1
23 SAT	.4348066E+01	181	0
24 SHD	.5270718E+01	181	0
25 ANT	.1700000E+01	1	0
26 ANTL1	.1000000E+01	1	0

	FAD	NC	P	RAVEN	TV	TY	TZT	TLK	RFK	SFK	CSFMR	EAFFP	RCUTP	SHONF	EX7
FAD	1.0000														
NC	.9121	1.0000													
P	.9450	.9906	1.0000												
RAVEN	.8977	.9225	.9759	1.0000											
TV	.9286	.9314	.9096	.9204	1.0000										
TY	-.8594	-.7760	-.8056	-.7465	-.6954	1.0000									
TZT	.8064	.7231	.7811	.7640	.6464	-.7409	1.0000								
TLK	-.0132	-.0201	-.0056	-.0600	-.1047	.0732	.0069	1.0000							
RFK	-.0338	-.0429	-.0516	-.0362	.0654	-.0414	-.0731	-.5948	1.0000						
SFK	-.0523	-.0634	-.0451	-.0778	-.1535	.1308	.0658	.7926	-.5485	1.0000					
CSFMR	-.0512	-.0694	-.0561	-.0597	-.1550	.1433	.0121	.7661	-.5902	.7328	1.0000				
EAFFP	.0304	.0105	.0161	-.0001	-.1851	.0648	-.0785	.0809	-.1690	.1446	.1497	1.0000			
RCUTP	.4740	.5231	.5156	.5352	.3839	-.3034	.4325	.3444	-.3461	.3182	.3412	.3909	1.0000		
SHONF	.3630	.4505	.4299	.3942	.3522	-.2710	.2524	-.0408	.0143	.0504	-.2385	.2687	.3407	1.0000	
EX7	.1855	.1002	.1118	.0771	-.0094	-.2581	-.0369	-.1262	.0391	-.1250	-.1327	-.0064	-.1618	.0665	1.0000
EX8	.1514	.1732	.1695	.1320	.1622	-.2441	.0698	-.1522	.0366	-.1256	-.1299	-.0683	-.1139	.0111	-.0326
EX9	.2440	.1790	.2007	.1384	.2008	-.2099	.1486	-.0894	.1239	-.1015	-.1049	-.1430	-.1258	-.0029	-.0253
EX0	.2047	.2218	.2380	.2223	.2774	-.2092	.2553	-.0911	.0464	-.1042	-.1077	-.1931	.0174	.0071	-.0271
EX1	.2074	.2457	.2553	.2911	.2668	-.1992	.3496	-.1127	.0869	-.0991	-.1025	-.2483	-.1130	.0342	-.0257
STR	.0777	.0549	.0489	.0394	.0325	-.0842	-.0478	-.1141	-.0142	-.0913	-.0943	.1138	.0097	.0811	.2066
ZA	-.8490	-.8208	-.8592	-.8019	-.6928	.7197	-.6480	-.0548	.1062	-.0005	-.0184	-.1682	-.4802	-.3699	-.2035
VD	.0023	.0099	.0041	.0259	.0160	-.0508	.0033	-.1136	.0706	-.1426	-.0131	-.1905	-.1554	-.1542	.0077
SAT	-.0051	.0009	-.0004	.0032	.0810	-.0038	-.0155	-.0760	.0622	-.0355	-.0879	-.0914	-.0898	.0328	-.0211
SHD	-.0031	-.0011	.0008	-.0408	.0138	.0034	.0124	-.0347	.0205	-.0291	-.1967	.0529	.0843	.4053	-.0524
ANT	-.0615	-.0084	-.0252	-.0088	.0460	.0513	-.0743	.0516	-.1114	-.0172	.1055	.0179	.0339	-.0269	-.0141
ANTL1	-.0157	-.0077	-.0229	-.0072	-.0371	.0503	-.0749	-.0180	.0189	-.0544	-.0160	.0255	.0207	.0141	-.0141
XCANF4	-.1365	-.2033	-.1862	-.2147	-.3519	.0022	-.1714	.0914	-.1222	.0984	.1425	.1818	-.0935	.0281	.5459

CORRELATION MATRIX

EX8	1.0000												
EX9	-.0256	1.0000											
EX0	-.0263	-.0212	1.0000										
EX1	-.0250	-.0202	-.0208	1.0000									
STR	-.0230	-.0186	-.0191	-.0182	1.0000								
ZA	-.2025	-.1636	-.1681	-.1599	-.0597	1.0000							
WD	.0563	.0403	.0729	.0760	-.0064	.0075	1.0000						
SAT	.0371	.0088	-.0032	.0041	-.0316	.0152	-.4552	1.0000					
SHD	-.0425	-.0110	-.0495	-.0471	.0290	-.0009	-.5860	.2181	1.0000				
ANT	-.0137	-.0111	-.0114	-.0138	-.0100	.0734	.1672	-.0558	-.1208	1.0000			
ANTLI	-.0137	-.0111	-.0114	-.0108	-.0100	.0826	-.0631	-.0558	.0691	-.0050	1.0000		
KCANFA	.0580	-.0887	-.1382	-.1244	-.5086	.0298	.1441	-.0358	-.0371	.0415	.0313	1.0000	
EX8	EX9	EX0	EX1	STR	ZA	WD	SAT	SHD	ANT	ANTLI	KCANFA		

VARIABLES	BETAS	MEANS(X)	STANDARD ERRORS	STUDENT-T	ELASTICITIES
1 FAD	-.1289092E+01	.1662500E+00	.5150654E+00	-.2502774E+01	-.1059638E+00
2 NC	-.1720948E+00	.3138985E+01	.8429652E-01	-.2041541E+01	-.2670964E+00
3 P	.2365112E+00	.1406331E+01	.5607820E+00	.4217526E+00	.1644861E+00
4 RAVEN	.1267048E+00	.7968799E+01	.3595086E-01	.3824388E+01	.4992255E+00
5 TW	-.1604084E+00	.4015184E+01	.3294440E-01	-.4869065E+01	-.3184517E+00
6 TY	-.4519828E+00	.2140038E+01	.5359276E-01	-.8431788E+01	-.4781434E+00
7 TZY	-.5968068E+00	.9963179E+00	.1895606E+00	-.3147318E+01	-.2938983E+00
8 TLK	-.4664144E-02	.1936095E+01	.6344903E-02	-.7351009E+00	-.4464876E-02
9 RFK	-.3432612E-01	.7128660E+00	.1151860E-01	-.2980059E+01	-.1209883E-01
10 SFK	-.2798248E-02	.2889871E+01	.2196750E-02	-.1273812E+01	-.3721891E-02
11 CSFMR	.1455497E-01	.2501124E+01	.2433110E-02	.5882042E+01	.1799938E-01
12 EANFP	.2416719E+00	.1234865E+01	.3597888E-01	.6717048E+01	.1475559E+00
13 RCUTP	.1442962E-01	.2350880E+01	.4478606E-02	.3221899E+01	.1677244E-01
14 SHOF	.6406945E-01	.2128348E+01	.1046154E-01	.6124285E+01	.6742238E-01
15 EX7	.2540063E+00	.1081861E+00	.1018834E-01	.2493106E+02	.1358710E-01
16 EX8	.2552626E-01	.2437640E+00	.3793832E-02	.6728357E+01	.3078576E-02
17 EX9	.2001382E-01	.1406952E+00	.5313986E-02	.3766197E+01	.1392239E-02
18 EX0	.1569094E-01	.1217808E+00	.6222053E-02	.2682545E+01	.1005010E-02
19 EX1	.1952519E-01	.1088501E+00	.7007619E-02	.2786281E+01	.1050837E-02
20 STR	-.7309646E+00	.2603550E-01	.2186971E-01	-.3342360E+02	-.9409648E-02
21 ZA	.4141023E-01	.4666435E+00	.2722999E-01	.1820759E+01	.9554409E-02
22 WD	.5726063E+00	.2082249E+01	.6320967E-01	.8426025E+01	.5403398E+00
23 SAT	.3624270E-01	.4343195E+01	.1063906E-01	.3406570E+01	.7782888E-01
24 SHD	.3573449E-01	.5272189E+01	.7652704E-02	.4669525E+01	.9315143E-01
25 ANT	-.9320197E-01	.5917160E-02	.5768267E-01	-.1615771E+01	-.2726775E-03
26 ANTL1	.7052779E-01	.5917160E-02	.5722660E-01	.1232430E+01	.2063405E-03
27 CONSTANT	-.7160540E+00	.1000000E+01	.5305124E+00	-.1349740E+01	-.3540436E+00

MEAN (Y)

= 2.022502542603

	Y	E(Y)	Y-E(Y)
13	.2229E+01	.2200E+01	.2888E-01
14	.2174E+01	.2210E+01	-.4391E-01
15	.2051E+01	.2104E+01	-.5287E-01
16	.2358E+01	.2332E+01	.2658E-01
17	.2181E+01	.2174E+01	.6970E-02
18	.2242E+01	.2194E+01	.4778E-01
19	.2092E+01	.2079E+01	.1292E-01
20	.1990E+01	.1977E+01	.1312E-01
21	.1938E+01	.2058E+01	-.1206E+00
22	.1987E+01	.2091E+01	-.1049E+00
23	.2102E+01	.2162E+01	-.5907E-01
24	.2028E+01	.2084E+01	-.5600E-01
25	.2149E+01	.2158E+01	-.8059E-02
26	.2071E+01	.2128E+01	-.5679E-01
27	.2036E+01	.2070E+01	-.3465E-01
28	.2168E+01	.2198E+01	-.2999E-01
29	.2136E+01	.2130E+01	.6276E-02
30	.2116E+01	.2117E+01	-.1257E-02
31	.2050E+01	.2021E+01	.2878E-01
32	.1912E+01	.1931E+01	-.1888E-01
33	.1897E+01	.1945E+01	-.4780E-01
34	.2030E+01	.2071E+01	-.4080E-01
35	.2135E+01	.2098E+01	.3755E-01
36	.2119E+01	.2023E+01	.9578E-01
37	.2227E+01	.2123E+01	.1042E+00
38	.2084E+01	.2059E+01	.2554E-01
39	.2113E+01	.2032E+01	.8041E-01
40	.2316E+01	.2261E+01	.5495E-01
41	.2097E+01	.2029E+01	.6750E-01
42	.2124E+01	.2074E+01	.4996E-01
43	.2059E+01	.2002E+01	.5695E-01
44	.1819E+01	.1830E+01	-.1017E-01
45	.1980E+01	.2026E+01	-.4603E-01
46	.1966E+01	.2027E+01	-.6094E-01
47	.2065E+01	.2013E+01	.5275E-01
48	.2106E+01	.2044E+01	.6250E-01
49	.2160E+01	.2082E+01	.7846E-01
50	.2086E+01	.2051E+01	.3457E-01
51	.1991E+01	.1937E+01	.5339E-01
52	.2256E+01	.2146E+01	.1107E+00
53	.2012E+01	.1977E+01	.3550E-01
54	.2113E+01	.2087E+01	.2661E-01
55	.2036E+01	.1965E+01	.7077E-01
56	.1797E+01	.1819E+01	-.2179E-01
57	.1946E+01	.1961E+01	-.1496E-01
58	.1930E+01	.2025E+01	-.9431E-01
59	.2079E+01	.2092E+01	-.1329E-01
60	.2117E+01	.2096E+01	.2150E-01
61	.2016E+01	.2109E+01	-.9272E-01
62	.2087E+01	.2136E+01	-.4903E-01
63	.1996E+01	.2028E+01	-.3204E-01
64	.2295E+01	.2256E+01	.3905E-01
65	.2008E+01	.1987E+01	.2130E-01
66	.2117E+01	.2110E+01	.7515E-02
67	.1981E+01	.1958E+01	.2254E-01
68	.1778E+01	.1798E+01	-.2006E-01
69	.1936E+01	.2001E+01	-.6517E-01

70	.1861E+01	.1969E+01	-.1082E+00
71	.2079E+01	.2078E+01	.2041E-03
72	.2117E+01	.2081E+01	.3621E-01
73	.1989E+01	.2054E+01	-.6518E-01
74	.2100E+01	.2071E+01	.2819E-01
75	.1942E+01	.1986E+01	-.4458E-01
76	.2161E+01	.2161E+01	-.5408E-03
77	.2017E+01	.2021E+01	-.4372E-02
78	.2076E+01	.2069E+01	.6953E-02
79	.1893E+01	.1887E+01	.5954E-02
80	.1844E+01	.1835E+01	.9326E-02
81	.1887E+01	.1914E+01	-.2650E-01
82	.1905E+01	.1956E+01	-.5104E-01
83	.2130E+01	.2110E+01	.2027E-01
84	.2026E+01	.1994E+01	.3141E-01
85	.2059E+01	.2059E+01	.2677E-03
86	.2086E+01	.2026E+01	.6022E-01
87	.2027E+01	.1977E+01	.4984E-01
88	.2121E+01	.2064E+01	.5705E-01
89	.2084E+01	.2057E+01	.2709E-01
90	.2016E+01	.2054E+01	-.3775E-01
91	.2003E+01	.1989E+01	.1417E-01
92	.1860E+01	.1845E+01	.1534E-01
93	.1903E+01	.1937E+01	-.3457E-01
94	.1995E+01	.2068E+01	-.7256E-01
95	.2126E+01	.2120E+01	.5819E-02
96	.2107E+01	.2056E+01	.5039E-01
97	.2154E+01	.2101E+01	.5292E-01
98	.2028E+01	.2026E+01	.2696E-02
99	.1987E+01	.1986E+01	.8483E-03
100	.2144E+01	.2144E+01	.1230E-05
101	.2114E+01	.2114E+01	.1212E-05
102	.2001E+01	.2054E+01	-.5270E-01
103	.9477E+00	.9320E+00	.1570E-01
104	.1785E+01	.1801E+01	-.1637E-01
105	.1836E+01	.1900E+01	-.6430E-01
106	.1889E+01	.1959E+01	-.6983E-01
107	.2006E+01	.2007E+01	-.1097E-02
108	.2050E+01	.2043E+01	.6967E-02
109	.1991E+01	.2102E+01	-.1106E+00
110	.1946E+01	.1989E+01	-.4274E-01
111	.1825E+01	.1924E+01	-.9913E-01
112	.2074E+01	.2161E+01	-.8694E-01
113	.1920E+01	.1764E+01	.1562E+00
114	.1956E+01	.2003E+01	-.4706E-01
115	.1919E+01	.1889E+01	.3022E-01
116	.1715E+01	.1689E+01	.2584E-01
117	.1907E+01	.1870E+01	.3682E-01
118	.1879E+01	.1987E+01	-.1081E+00
119	.2141E+01	.2129E+01	.1190E-01
120	.2264E+01	.2202E+01	.6171E-01
121	.2223E+01	.2242E+01	-.1902E-01
122	.2203E+01	.2202E+01	.1543E-02
123	.1957E+01	.2026E+01	-.6847E-01
124	.2247E+01	.2224E+01	.2276E-01
125	.2283E+01	.2138E+01	.1450E+00
126	.3029E+01	.2965E+01	.4394E-01
127	.2897E+01	.2897E+01	-.1929E-03
128	.2858E+01	.2839E+01	.1831E-01
129	.3111E+01	.3145E+01	-.3474E-01
130	.1811E+01	.1857E+01	-.4610E-01
131	.9558E+00	.9438E+00	.1206E-01
132	.2107E+01	.2072E+01	.3499E-01
133	.2050E+01	.2087E+01	-.3696E-01

134	.2021E+01	.2034E+01	-.1226E-01
135	.1910E+01	.1920E+01	-.9507E-02
136	.2163E+01	.2092E+01	.7126E-01
137	.2014E+01	.2005E+01	.8453E-02
138	.2180E+01	.2174E+01	.5579E-02
139	.2021E+01	.2065E+01	-.4399E-01
140	.2037E+01	.2006E+01	.3041E-01
141	.2154E+01	.2149E+01	.4644E-02
142	.2081E+01	.2111E+01	-.3024E-01
143	.2167E+01	.2094E+01	.7316E-01
144	.2081E+01	.1982E+01	.9956E-01
145	.2024E+01	.2039E+01	-.1463E-01
146	.2015E+01	.2037E+01	-.2249E-01
147	.1974E+01	.1935E+01	.3903E-01
148	.2072E+01	.2089E+01	-.1697E-01
149	.1847E+01	.1878E+01	-.3152E-01
150	.1930E+01	.1807E+01	.4335E-01
151	.1892E+01	.1875E+01	.1721E-01
152	.1856E+01	.1824E+01	.3232E-01
153	.1904E+01	.1928E+01	-.2361E-01
154	.1870E+01	.1918E+01	-.4819E-01
155	.1979E+01	.1983E+01	-.3706E-02
156	.1878E+01	.1856E+01	.2271E-01
157	.1926E+01	.1948E+01	-.2234E-01
158	.1825E+01	.1927E+01	-.1000E+00
159	.1809E+01	.1808E+01	.7216E-03
160	.1938E+01	.1948E+01	-.1051E-01
161	.1921E+01	.1896E+01	.2465E-01
162	.1840E+01	.1831E+01	.9903E-02
163	.1869E+01	.1884E+01	-.1576E-01
164	.1765E+01	.1738E+01	.2687E-01
165	.1803E+01	.1797E+01	.6078E-02
166	.1847E+01	.1902E+01	-.5522E-01
167	.1902E+01	.1917E+01	-.1570E-01
168	.1894E+01	.1873E+01	.2027E-01
169	.1992E+01	.1998E+01	-.5956E-02
170	.1839E+01	.1896E+01	-.5733E-01
171	.1888E+01	.1847E+01	.4029E-01
172	.2103E+01	.2073E+01	.2997E-01
173	.1923E+01	.1905E+01	.1804E-01
174	.1882E+01	.1838E+01	.4419E-01
175	.1896E+01	.1860E+01	.3533E-01
176	.1757E+01	.1753E+01	.4912E-02
177	.1842E+01	.1856E+01	-.1363E-01
178	.1844E+01	.1887E+01	-.4304E-01
179	.1923E+01	.1927E+01	-.4126E-02
180	.2043E+01	.1978E+01	.6473E-01
181	.1954E+01	.2061E+01	-.1073E+00

MEAN (V**) = 1.022502542603
 R2 (V**) = .9519053820868
 PSEUDO-(L)-R2 = .9519053820868
 ERROR VARIANCE = .00245882908439

	V**	E(V**)	X**B	E(V**)-X**B	V** - E(V**)	V** - X**B
13	.1229E+01	.1200E+01	.1200E+01	0.	.2887E-01	.2887E-01
14	.1174E+01	.1218E+01	.1218E+01	0.	-.4391E-01	-.4391E-01
15	.1051E+01	.1104E+01	.1104E+01	0.	-.5287E-01	-.5287E-01
16	.1358E+01	.1332E+01	.1332E+01	0.	.2658E-01	.2658E-01
17	.1181E+01	.1174E+01	.1174E+01	0.	.6968E-02	.6968E-02
18	.1242E+01	.1194E+01	.1194E+01	0.	.4778E-01	.4778E-01
19	.1092E+01	.1079E+01	.1079E+01	0.	.1292E-01	.1292E-01
20	.9905E+00	.9774E+00	.9774E+00	0.	.1312E-01	.1312E-01
21	.9378E+00	.1058E+01	.1058E+01	0.	-.1207E+00	-.1207E+00
22	.9866E+00	.1091E+01	.1091E+01	0.	-.1049E+00	-.1049E+00
23	.1102E+01	.1162E+01	.1162E+01	0.	-.5907E-01	-.5907E-01
24	.1028E+01	.1084E+01	.1084E+01	0.	-.5601E-01	-.5601E-01
25	.1149E+01	.1158E+01	.1158E+01	0.	-.8060E-02	-.8060E-02
26	.1071E+01	.1128E+01	.1128E+01	0.	-.5679E-01	-.5679E-01
27	.1036E+01	.1070E+01	.1070E+01	0.	-.3465E-01	-.3465E-01
28	.1168E+01	.1198E+01	.1198E+01	0.	-.2999E-01	-.2999E-01
29	.1136E+01	.1130E+01	.1130E+01	0.	.6274E-02	.6274E-02
30	.1116E+01	.1117E+01	.1117E+01	0.	-.1258E-02	-.1258E-02
31	.1050E+01	.1021E+01	.1021E+01	0.	.2878E-01	.2878E-01
32	.9123E+00	.9312E+00	.9312E+00	0.	-.1888E-01	-.1888E-01
33	.8971E+00	.9449E+00	.9449E+00	0.	-.4780E-01	-.4780E-01
34	.1030E+01	.1071E+01	.1071E+01	0.	-.4080E-01	-.4080E-01
35	.1135E+01	.1098E+01	.1098E+01	0.	.3755E-01	.3755E-01
36	.1119E+01	.1023E+01	.1023E+01	0.	.9578E-01	.9578E-01
37	.1227E+01	.1123E+01	.1123E+01	0.	.1042E+00	.1042E+00
38	.1084E+01	.1059E+01	.1059E+01	0.	.2554E-01	.2554E-01
39	.1113E+01	.1032E+01	.1032E+01	0.	.8041E-01	.8041E-01
40	.1316E+01	.1261E+01	.1261E+01	0.	.5495E-01	.5495E-01
41	.1097E+01	.1029E+01	.1029E+01	0.	.6750E-01	.6750E-01
42	.1124E+01	.1074E+01	.1074E+01	0.	.4996E-01	.4996E-01
43	.1059E+01	.1002E+01	.1002E+01	0.	.5695E-01	.5695E-01
44	.8194E+00	.8296E+00	.8296E+00	0.	-.1018E-01	-.1018E-01
45	.9805E+00	.1026E+01	.1026E+01	0.	-.4603E-01	-.4603E-01
46	.9661E+00	.1027E+01	.1027E+01	0.	-.6094E-01	-.6094E-01
47	.1065E+01	.1013E+01	.1013E+01	0.	.5275E-01	.5275E-01
48	.1106E+01	.1044E+01	.1044E+01	0.	.6250E-01	.6250E-01
49	.1160E+01	.1082E+01	.1082E+01	0.	.7846E-01	.7846E-01
50	.1086E+01	.1051E+01	.1051E+01	0.	.3457E-01	.3457E-01
51	.9907E+00	.9374E+00	.9374E+00	0.	.5339E-01	.5339E-01
52	.1256E+01	.1146E+01	.1146E+01	0.	.1107E+00	.1107E+00
53	.1012E+01	.9768E+00	.9768E+00	0.	.3550E-01	.3550E-01
54	.1113E+01	.1087E+01	.1087E+01	0.	.2661E-01	.2661E-01
55	.1036E+01	.9647E+00	.9647E+00	0.	.7077E-01	.7077E-01
56	.7972E+00	.8190E+00	.8190E+00	0.	-.2179E-01	-.2179E-01
57	.9461E+00	.9611E+00	.9611E+00	0.	-.1497E-01	-.1497E-01
58	.9305E+00	.1025E+01	.1025E+01	0.	-.9431E-01	-.9431E-01
59	.1079E+01	.1092E+01	.1092E+01	0.	-.1329E-01	-.1329E-01
60	.1117E+01	.1096E+01	.1096E+01	0.	.2150E-01	.2150E-01
61	.1016E+01	.1109E+01	.1109E+01	0.	-.9272E-01	-.9272E-01

PLOT OF RESIDUALS W = V** - X**B



62	.1087E+01	.1138E+01	.1136E+01	0.	-4.4903E-01	-4.4903E-01
63	.9959E+00	.1028E+01	.1028E+01	0.	-.3204E-01	-.3204E-01
64	.1295E+01	.1256E+01	.1256E+01	0.	.3904E-01	.3904E-01
65	.1008E+01	.9869E+00	.9869E+00	0.	.2130E-01	.2130E-01
66	.1117E+01	.1110E+01	.1110E+01	0.	.7514E-02	.7514E-02
67	.9809E+00	.9584E+00	.9584E+00	0.	.2254E-01	.2254E-01
68	.7784E+00	.7985E+00	.7985E+00	.4522-287	-.2006E-01	-.2006E-01
69	.9358E+00	.1001E+01	.1001E+01	0.	-.6517E-01	-.6517E-01
70	.8613E+00	.9695E+00	.9695E+00	0.	-.1082E+00	-.1082E+00
71	.1079E+01	.1078E+01	.1078E+01	0.	.2029E-03	.2029E-03
72	.1117E+01	.1081E+01	.1081E+01	0.	.3621E-01	.3621E-01
73	.9887E+00	.1054E+01	.1054E+01	0.	-.6518E-01	-.6518E-01
74	.1100E+01	.1071E+01	.1071E+01	0.	.2819E-01	.2819E-01
75	.9418E+00	.9863E+00	.9863E+00	0.	-.4458E-01	-.4458E-01
76	.1161E+01	.1161E+01	.1161E+01	0.	-.5420E-03	-.5420E-03
77	.1017E+01	.1021E+01	.1021E+01	0.	-.4373E-02	-.4373E-02
78	.1076E+01	.1069E+01	.1069E+01	0.	.6952E-02	.6952E-02
79	.8932E+00	.8873E+00	.8873E+00	0.	.5953E-02	.5953E-02
80	.8451E+00	.8351E+00	.8351E+00	0.	.9325E-02	.9325E-02
81	.8871E+00	.9136E+00	.9136E+00	0.	-.2650E-01	-.2650E-01
82	.9047E+00	.9558E+00	.9558E+00	0.	-.5104E-01	-.5104E-01
83	.1130E+01	.1110E+01	.1110E+01	0.	.2027E-01	.2027E-01
84	.1026E+01	.9943E+00	.9943E+00	0.	.3141E-01	.3141E-01
85	.1059E+01	.1059E+01	.1059E+01	0.	.2665E-03	.2665E-03
86	.1086E+01	.1026E+01	.1026E+01	0.	.6022E-01	.6022E-01
87	.1027E+01	.9769E+00	.9769E+00	0.	.4984E-01	.4984E-01
88	.1121E+01	.1064E+01	.1064E+01	0.	.5705E-01	.5705E-01
89	.1084E+01	.1057E+01	.1057E+01	0.	.2709E-01	.2709E-01
90	.1016E+01	.1054E+01	.1054E+01	0.	-.3775E-01	-.3775E-01
91	.1033E+01	.9890E+00	.9890E+00	0.	.1417E-01	.1417E-01
92	.8599E+00	.8446E+00	.8446E+00	0.	.1534E-01	.1534E-01
93	.9026E+00	.9372E+00	.9372E+00	0.	-.3457E-01	-.3457E-01
94	.9952E+00	.1068E+01	.1068E+01	0.	-.7256E-01	-.7256E-01
95	.1126E+01	.1120E+01	.1120E+01	0.	.5818E-02	.5818E-02
96	.1107E+01	.1056E+01	.1056E+01	0.	.5039E-01	.5039E-01
97	.1154E+01	.1101E+01	.1101E+01	0.	.5292E-01	.5292E-01
98	.1028E+01	.1026E+01	.1026E+01	0.	.2695E-02	.2695E-02
99	.9866E+00	.9858E+00	.9858E+00	0.	.8472E-03	.8472E-03
100	.1144E+01	.1144E+01	.1144E+01	0.	.1978E-09	.1978E-09
101	.1114E+01	.1114E+01	.1114E+01	0.	.1983E-09	.1983E-09
102	.1001E+01	.1054E+01	.1054E+01	0.	-.5270E-01	-.5270E-01
103	-.5229E-01	-.6799E-01	-.6799E-01	.3850E-78	.1570E-01	.1570E-01
104	.7847E+00	.8011E+00	.8011E+00	.6599-288	-.1637E-01	-.1637E-01
105	.8359E+00	.9002E+00	.9002E+00	0.	-.6430E-01	-.6430E-01
106	.8891E+00	.9589E+00	.9589E+00	0.	-.6983E-01	-.6983E-01
107	.1005E+01	.1007E+01	.1007E+01	0.	-.1098E-02	-.1098E-02
108	.1050E+01	.1043E+01	.1043E+01	0.	.6966E-02	.6966E-02
109	.9910E+00	.1102E+01	.1102E+01	0.	-.1106E+00	-.1106E+00
110	.9461E+00	.9889E+00	.9889E+00	0.	-.4274E-01	-.4274E-01

126	.2029E+01	.1985E+01	.1985E+01	0.	.4394E-01	.4394E-01
127	.1897E+01	.1897E+01	.1897E+01	0.	-.1945E-03	-.1945E-03
128	.1858E+01	.1839E+01	.1839E+01	0.	.1831E-01	.1831E-01
129	.2111E+01	.2145E+01	.2145E+01	0.	-.3474E-01	-.3474E-01
130	.8108E+00	.8569E+00	.8569E+00	0.	-.4610E-01	-.4610E-01
131	-.4418E-01	-.5624E-01	-.5624E-01	.4349E-80	.1206E-01	.1206E-01
132	.1107E+01	.1072E+01	.1072E+01	0.	.3499E-01	.3499E-01
133	.1050E+01	.1087E+01	.1087E+01	0.	-.3696E-01	-.3696E-01
134	.1021E+01	.1034E+01	.1034E+01	0.	-.1227E-01	-.1227E-01
135	.9102E+00	.9198E+00	.9198E+00	0.	-.9508E-02	-.9508E-02
136	.1163E+01	.1092E+01	.1092E+01	0.	.7126E-01	.7126E-01
137	.1014E+01	.1005E+01	.1005E+01	0.	.8451E-02	.8451E-02
138	.1180E+01	.1174E+01	.1174E+01	0.	.5578E-02	.5578E-02
139	.1021E+01	.1065E+01	.1065E+01	0.	-.4399E-01	-.4399E-01
140	.1037E+01	.1006E+01	.1006E+01	0.	.3041E-01	.3041E-01
141	.1154E+01	.1149E+01	.1149E+01	0.	.4643E-02	.4643E-02
142	.1081E+01	.1111E+01	.1111E+01	0.	-.3024E-01	-.3024E-01
143	.1167E+01	.1094E+01	.1094E+01	0.	.7316E-01	.7316E-01
144	.1081E+01	.9819E+00	.9819E+00	0.	.9956E-01	.9956E-01
145	.1024E+01	.1039E+01	.1039E+01	0.	-.1463E-01	-.1463E-01
146	.1015E+01	.1037E+01	.1037E+01	0.	-.2249E-01	-.2249E-01
147	.9741E+00	.9350E+00	.9350E+00	0.	.3903E-01	.3903E-01
148	.1072E+01	.1089E+01	.1089E+01	0.	-.1697E-01	-.1697E-01
149	.8469E+00	.8784E+00	.8784E+00	0.	-.3152E-01	-.3152E-01
150	.9302E+00	.8868E+00	.8868E+00	0.	.4335E-01	.4335E-01
151	.8924E+00	.8752E+00	.8752E+00	0.	.1721E-01	.1721E-01
152	.8560E+00	.8236E+00	.8236E+00	0.	.3232E-01	.3232E-01
153	.9040E+00	.9276E+00	.9276E+00	0.	-.2361E-01	-.2361E-01
154	.8703E+00	.9185E+00	.9185E+00	0.	-.4819E-01	-.4819E-01
155	.9795E+00	.9832E+00	.9832E+00	0.	-.3707E-02	-.3707E-02
156	.8785E+00	.8557E+00	.8557E+00	0.	.2271E-01	.2271E-01
157	.9256E+00	.9479E+00	.9479E+00	0.	-.2234E-01	-.2234E-01
158	.8248E+00	.9248E+00	.9248E+00	0.	-.1000E+00	-.1000E+00
159	.8087E+00	.8080E+00	.8080E+00	.4071-290	.7205E-03	.7205E-03
160	.9377E+00	.9482E+00	.9482E+00	0.	-.1051E-01	-.1051E-01
161	.9210E+00	.8964E+00	.8964E+00	0.	.2465E-01	.2465E-01
162	.8404E+00	.8305E+00	.8305E+00	0.	.9902E-02	.9902E-02
163	.8686E+00	.8844E+00	.8844E+00	0.	-.1576E-01	-.1576E-01
164	.7652E+00	.7383E+00	.7383E+00	.2832-268	.2687E-01	.2687E-01
165	.8027E+00	.7966E+00	.7966E+00	.1793-286	.6077E-02	.6077E-02
166	.8469E+00	.9021E+00	.9021E+00	0.	-.5522E-01	-.5522E-01
167	.9017E+00	.9174E+00	.9174E+00	0.	-.1570E-01	-.1570E-01
168	.8936E+00	.8733E+00	.8733E+00	0.	.2027E-01	.2027E-01
169	.9916E+00	.9976E+00	.9976E+00	0.	-.5958E-02	-.5958E-02
170	.8388E+00	.8962E+00	.8962E+00	0.	-.5733E-01	-.5733E-01
171	.8877E+00	.8474E+00	.8474E+00	0.	.4029E-01	.4029E-01
172	.1103E+01	.1073E+01	.1073E+01	0.	.2997E-01	.2997E-01
173	.9230E+00	.9049E+00	.9049E+00	0.	.1804E-01	.1804E-01
174	.8819E+00	.8377E+00	.8377E+00	0.	.4419E-01	.4419E-01
175	.8956E+00	.8603E+00	.8603E+00	0.	.3533E-01	.3533E-01
176	.7575E+00	.7525E+00	.7525E+00	.1137-272	.4911E-02	.4911E-02
177	.8421E+00	.8557E+00	.8557E+00	0.	-.1364E-01	-.1364E-01
178	.8440E+00	.8870E+00	.8870E+00	0.	-.4304E-01	-.4304E-01
179	.9233E+00	.9274E+00	.9274E+00	0.	-.4127E-02	-.4127E-02
180	.1043E+01	.9778E+00	.9778E+00	0.	.6473E-01	.6473E-01
181	.9541E+00	.1061E+01	.1061E+01	0.	-.1073E+00	-.1073E+00



ANALYSIS OF RESIDUALS

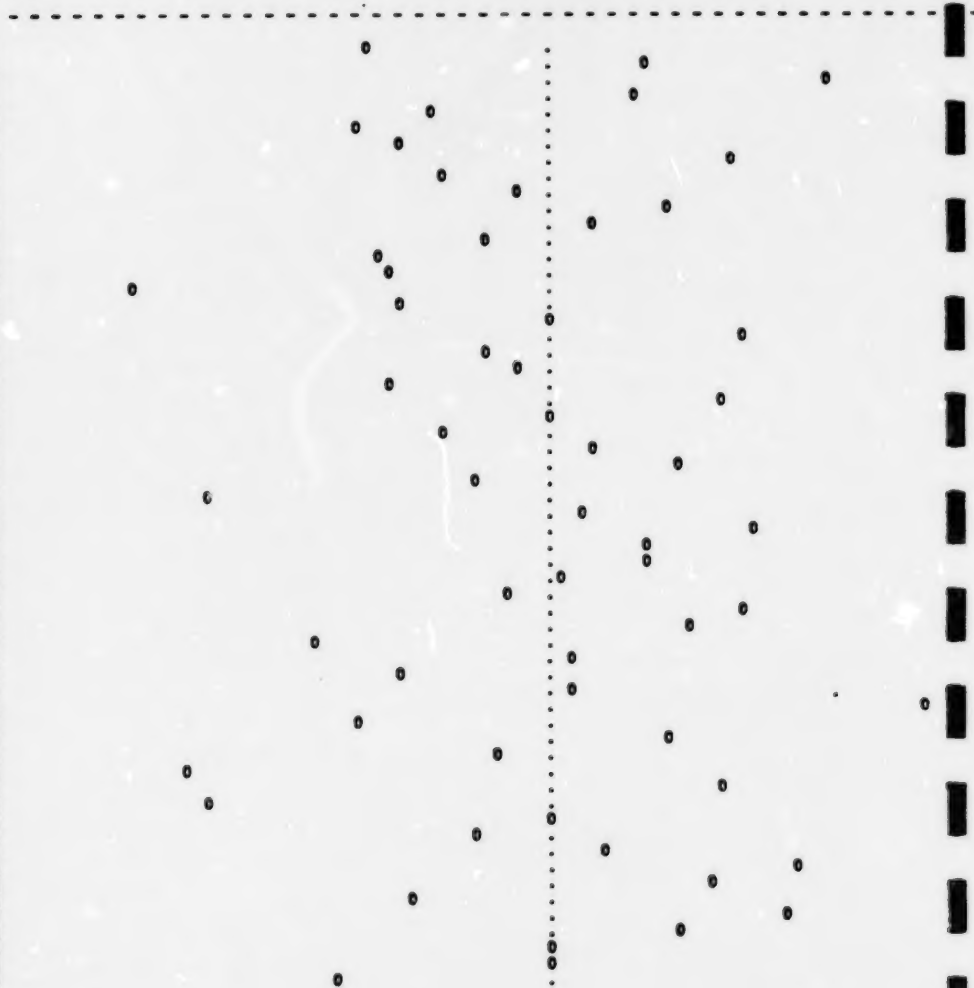
AUTOCORRELATION AND PARTIAL AUTOCORRELATION FUNCTIONS

N= 169

DIFFERENCE		LAGS	AUTOCORRELATIONS												STD-ERROR
			ROW												
0	12 0														
(1-B)	(1-B)	1-12	.25	.04	.09	.06	.02	-.01	.03	-.01	-.01	-.10	.07	.37	.08
VAR =	.2459E-02														
	13-24		-.03	-.23	-.12	-.06	-.08	-.09	-.05	-.13	-.12	-.23	-.04	.13	.08
	25-36		-.04	-.29	-.09	-.00	-.04	-.04	-.03	-.07	-.08	-.09	.05	.23	.10
	37-48		.14	-.14	.09	.06	-.02	-.04	-.01	.04	-.06	.05	.15	.33	.11
	49-60		.19	-.08	-.00	.01	-.03	-.03	-.03	-.04	-.14	-.01	-.04	.12	.12
1	12 0														
(1-B)	(1-B)	1-12	-.33	-.19	.04	.02	-.00	-.05	.06	-.03	.07	-.18	-.11	.48	.08
VAR =	.3527E-02														
	13-24		-.13	-.22	.03	.06	-.01	-.04	.09	-.06	.07	-.20	-.01	.25	.09
	25-36		.06	-.31	.06	.09	-.01	-.02	.04	-.03	.01	-.11	-.04	.19	.11
	37-48		.15	-.36	.16	.03	-.03	-.05	-.00	.10	-.13	-.01	-.06	.22	.12
	49-60		.10	-.24	.03	.03	-.01	-.01	.02	.08	-.17	.09	-.12	.17	.13
0	12 1														
(1-B)	(1-B)	1-12	.39	.33	.25	.18	.10	.06	.04	.02	.02	.02	-.06	-.25	.08
VAR =	.2911E-02														
	13-24		-.18	-.10	-.13	-.10	-.08	-.07	-.05	-.14	-.14	-.23	-.19	-.31	.11
	25-36		-.18	-.18	-.15	-.02	.00	.02	-.00	-.07	.03	.00	.01	-.01	.12
	37-48		.08	.03	.17	.04	.01	-.01	.04	.17	.12	.11	.22	.26	.13
	49-60		.16	.14	.06	-.01	.02	.02	-.05	-.01	-.10	.01	-.11	-.13	.14
1	12 1														
(1-B)	(1-B)	1-12	-.43	.01	-.01	.01	-.04	-.00	-.00	-.02	.01	.07	.09	-.22	.08
VAR =	.3475E-02														
	13-24		-.02	.10	-.05	.02	.00	-.01	.08	-.06	.07	-.12	.13	-.19	.09
	25-36		.09	-.02	-.07	.08	.01	.05	.03	-.15	.10	-.00	.01	-.09	.10
	37-48		.14	-.17	.22	-.07	-.02	-.07	-.06	.13	-.00	-.09	.04	.12	.11
	49-60		-.06	.04	.01	-.12	.04	.05	-.06	.09	-.14	.17	-.07	-.04	.12
DIFFERENCE		LAGS	PARTIAL AUTOCORRELATIONS												STD-ERROR
			ROW												
0	12 0														
(1-B)	(1-B)	1-12	.25	-.03	.09	.02	.00	-.03	.03	-.03	.01	-.11	.13	.35	.08
1	12 0														
(1-B)	(1-B)	1-12	-.33	-.33	-.20	-.14	-.10	-.13	-.04	-.07	.05	-.19	-.34	.27	.08
0	12 1														
(1-B)	(1-B)	1-12	.39	.21	.09	.02	-.04	-.03	.00	.00	.01	.01	-.10	-.27	.08
1	12 1														
(1-B)	(1-B)	1-12	-.43	-.22	-.12	-.06	-.08	-.08	-.07	-.08	-.05	.05	.20	-.09	.08

PLOT OF RESIDUALS (ON HORIZONTAL AXIS) AGAINST SERIES SHOWF (ON VERTICAL AXIS)

	RESIDUALS	SHOWF
15	-.52858E-01	.11300E+01
74	.28188E-01	.11312E+01
39	.80408E-01	.11537E+01
38	.25538E-01	.11785E+01
27	-.34649E-01	.12062E+01
26	-.56787E-01	.12067E+01
14	-.43908E-01	.12285E+01
51	.53386E-01	.12468E+01
53	-.32041E-01	.12714E+01
44	-.10176E-01	.12821E+01
50	.34570E-01	.12961E+01
20	.13123E-01	.13046E+01
32	-.18884E-01	.13240E+01
62	.49030E-01	.13828E+01
33	-.47801E-01	.14045E+01
21	-.12065E+00	.14123E+01
75	-.44582E-01	.14146E+01
99	.84718E-03	.14305E+01
40	.54951E-01	.14381E+01
68	-.20060E-01	.14404E+01
135	-.95079E-02	.14852E+01
45	-.46029E-01	.14926E+01
87	.49841E-01	.14930E+01
159	.72054E-03	.14937E+01
28	-.29991E-01	.15127E+01
19	.12916E-01	.15456E+01
147	.39028E-01	.15475E+01
56	-.21793E-01	.15563E+01
111	-.99136E-01	.15654E+01
80	.93247E-02	.15800E+01
86	.60216E-01	.15831E+01
31	.28783E-01	.15877E+01
16	.26581E-01	.15926E+01
98	.26948E-02	.15934E+01
134	-.12265E-01	.15987E+01
43	.56946E-01	.16038E+01
171	.40287E-01	.16048E+01
123	-.68469E-01	.16166E+01
29	.62745E-02	.16229E+01
110	-.42739E-01	.16390E+01
17	.69683E-02	.16419E+01
52	.11067E+00	.16569E+01
170	-.57331E-01	.16618E+01
53	.35501E-01	.16664E+01
57	-.14965E-01	.16690E+01
22	-.10486E+00	.17314E+01
42	.49955E-01	.17354E+01
158	-.10005E+00	.17427E+01
76	-.54204E-03	.17433E+01
146	-.22490E-01	.17453E+01
92	.15336E-01	.17526E+01
55	.70766E-01	.17682E+01
18	.47780E-01	.17712E+01
34	-.40800E-01	.17791E+01
41	.67498E-01	.17966E+01
64	.39044E-01	.18054E+01
30	-.12582E-02	.18123E+01
122	.15422E-02	.18380E+01
46	-.60936E-01	.18409E+01



88 .57053E-01 .18562E+01
79 .59531E-02 .18573E+01
93 .34568E-01 .18574E+01
104 .16368E-01 .18653E+01
65 .21301E-01 .18657E+01
105 .64301E-01 .18685E+01
58 .94310E-01 .18784E+01
100 .19776E-09 .18849E+01
23 .59075E-01 .19030E+01
54 .26606E-01 .19158E+01
47 .52752E-01 .19170E+01
140 .30407E-01 .19248E+01
116 .25837E-01 .19257E+01
91 .14169E-01 .19317E+01
69 .65168E-01 .19368E+01
172 .29969E-01 .19404E+01
67 .22536E-01 .19507E+01
152 .32319E-01 .19513E+01
66 .75142E-02 .19608E+01
59 .13290E-01 .19683E+01
89 .27085E-01 .19777E+01
160 .10514E-01 .19881E+01
81 .26501E-01 .19920E+01
70 .10823E+00 .19977E+01
35 .37546E-01 .20027E+01
165 .60765E-02 .20148E+01
164 .26870E-01 .20326E+01
103 .15702E-01 .20334E+01
77 .43734E-02 .20481E+01
128 .18305E-01 .20639E+01
136 .71257E-01 .20645E+01
153 .23614E-01 .20669E+01
78 .69519E-02 .20680E+01
112 .86937E-01 .20720E+01
82 .61038E-01 .20794E+01
148 .16970E-01 .20854E+01
36 .5783E-01 .20930E+01
48 .62496E-01 .21135E+01
24 .56005E-01 .21172E+01
177 .13636E-01 .21401E+01
161 .24646E-01 .21405E+01
90 .37749E-01 .21596E+01
141 .46430E-02 .21602E+01
117 .36816E-01 .21700E+01
71 .20288E-03 .21740E+01
102 .52702E-01 .21767E+01
94 .72562E-01 .21997E+01
142 .30237E-01 .22043E+01
83 .20267E-01 .22144E+01
176 .49110E-02 .22247E+01
137 .84515E-02 .22249E+01
139 .43992E-01 .22458E+01
149 .31517E-01 .22469E+01
101 .19834E-09 .22472E+01
114 .47060E-01 .22823E+01
129 .34743E-01 .22955E+01
154 .48195E-01 .23026E+01
166 .55221E-01 .23207E+01
124 .22762E-01 .23392E+01
106 .69828E-01 .23434E+01
151 .17211E-01 .23531E+01
60 .21497E-01 .23568E+01
115 .30221E-01 .23586E+01
138 .55776E-02 .23701E+01



143	.73161E-01	.23797E+01
125	.14501E+00	.24078E+01
113	.15520E+00	.24100E+01
127	.19455E-03	.24155E+01
125	.43939E-01	.24544E+01
173	.18038E-01	.24672E+01
162	.99019E-02	.24711E+01
178	.43038E-01	.25062E+01
150	.43352E-01	.25322E+01
96	.68176E-02	.25430E+01
167	.15700E-01	.25711E+01
107	.10984E-02	.25782E+01
175	.35331E-01	.25829E+01
72	.36208E-01	.25895E+01
131	.12056E-01	.26027E+01
174	.44186E-01	.26072E+01
179	.41266E-02	.26266E+01
119	.11896E-01	.26574E+01
130	.44096E-01	.26646E+01
163	.15760E-01	.26739E+01
13	.28874E-01	.26985E+01
84	.31408E-01	.27019E+01
96	.50386E-01	.27128E+01
155	.37069E-02	.27309E+01
118	.10809E+00	.27312E+01
37	.10420E+00	.27426E+01
25	.80601E-02	.27543E+01
168	.20270E-01	.28169E+01
156	.22707E-01	.28301E+01
49	.78461E-01	.28900E+01
144	.99560E-01	.29800E+01
108	.69661E-02	.30379E+01
61	.92720E-01	.30450E+01
73	.65177E-01	.31561E+01
180	.64731E-01	.31972E+01
120	.61707E-01	.32120E+01
85	.26653E-03	.33904E+01
132	.34993E-01	.34782E+01
97	.52919E-01	.35007E+01
145	.14630E-01	.35893E+01
109	.11061E+00	.36612E+01
157	.22337E-01	.40897E+01
133	.36964E-01	.41631E+01
121	.19017E-01	.42450E+01
169	.59576E-02	.43585E+01
181	.10735E+00	.45578E+01



INITIALIZATION CARDS FOR CONTROL ROUTINE FOLLOW - - ID CARD - NO. PARAMETERS , NO. STEPS , STEP SIZE .
MINIMIZATION TOLERANCE - STARTING VALUES OF PARAMETERS - RELATIVE UNCERTAINTIES OF PARAMETERS (ERROR ESTIMATES) -
AND STARTING DIRECTION (RELATIVE PARAMETER INCREMENTS FOR 1ST STEP)

AUTOCORRELATION AND HETEROSCEDASTICITY, FIVE GROUPS OF LAMBDA'S (X)

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AUTOCORRELATION AND METEOROLOGICALITY, FIVE GROUPS OF LAMBDAS (X)
      10      100      1E+01      1E+02      1E+03      1E+04      1E+05      1E+06
0.      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
.10000E+01 .10000E+01 .10000E+01 .10000E+01 .10000E+01 .10000E+01 .10000E+01 .10000E+01 .10000E+01 .10000E+01
0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
FIRST ENTRY TO FCN , PARAMETERS OF CURRENT STEP FOLLOW - - F,X(I)
-.8078800674E+03 0.      0.      .10000E+01 .10000E+01 .10000E+01 .10000E+01 .10000E+01 .10000E+01
0.      .10000E+01
NEW ABSOLUTE MINIMUM , PARAMETERS FOR FCN ENTRY 8 FOLLOW - - F,X(I)
-.8398365915E+03 .36056E+00 .56117E+00 .10093E+01 .99835E+00 .99703E+00 .96943E+00 .99368E+00 .92673E+00
.66718E-01 .10000E+01
NEW ABSOLUTE MINIMUM , PARAMETERS FOR FCN ENTRY 10 FOLLOW - - F,X(I)
-.8453445227E+03 .11056E+00 .86385E+00 .10348E+01 .99123E+00 .95281E+00 .94294E+00 .97090E+00 .97167E+00
.24875E+00 .10110E+01
NEW ABSOLUTE MINIMUM , PARAMETERS FOR FCN ENTRY 14 FOLLOW - - F,X(I)
-.8482804909E+03 .13627E+00 .98563E+00 .16482E+01 .77043E+00 .35162E+00 .15145E+01 .68556E+00 .11467E+01
.41644E+00 .10540E+01
NEW ABSOLUTE MINIMUM , PARAMETERS FOR FCN ENTRY 17 FOLLOW - - F,X(I)
-.8503086633E+03 .92662E-01 .10833E+01 .20972E+01 .60705E+00 .87089E-01 .19198E+01 .47776E+00 .10184E+01
.47450E+00 .10626E+01
NEW ABSOLUTE MINIMUM , PARAMETERS FOR FCN ENTRY 21 FOLLOW - - F,X(I)
-.8511794813E+03 .71029E-01 .11547E+01 .21312E+01 .55331E+00 .85589E+00 .19867E+01 .26641E+00 .10159E+01
.33532E+00 .72868E+00
NEW ABSOLUTE MINIMUM , PARAMETERS FOR FCN ENTRY 24 FOLLOW - - F,X(I)
-.8522214819E+03 .12404E+00 .11367E+01 .20960E+01 .51528E+00 .11006E+01 .19533E+01 .25550E-01 .92992E+00
.43072E+00 .41101E+00
NEW ABSOLUTE MINIMUM , PARAMETERS FOR FCN ENTRY 27 FOLLOW - - F,X(I)
-.8524606046E+03 .10872E+00 .11482E+01 .17617E+01 .56431E+00 .14019E+01 .20468E+01 .19340E+00 .91893E+00
.35548E+00 .49193E+00
NEW ABSOLUTE MINIMUM , PARAMETERS FOR FCN ENTRY 30 FOLLOW - - F,X(I)
-.8528668729E+03 .11726E+00 .11278E+01 .17978E+01 .54404E+00 .17186E+01 .18312E+01 .30650E+00 .95110E+00
.35063E+00 .54091E+00
NEW ABSOLUTE MINIMUM , PARAMETERS FOR FCN ENTRY 32 FOLLOW - - F,X(I)
-.8526163489E+03 .12358E+00 .10789E+01 .18650E+01 .58084E+00 .19260E+01 .17176E+01 .19897E+00 .94095E+00
.38762E+00 .42302E+00
NEW ABSOLUTE MINIMUM , PARAMETERS FOR FCN ENTRY 35 FOLLOW - - F,X(I)
-.8526401156E+03 .13794E+00 .10324E+01 .19500E+01 .62915E+00 .19415E+01 .17697E+01 .25821E+00 .94734E+00
.46592E+00 .21516E+00
NEW ABSOLUTE MINIMUM , PARAMETERS FOR FCN ENTRY 37 FOLLOW - - F,X(I)
-.8526427994E+03 .14003E+00 .10318E+01 .19727E+01 .63268E+00 .19971E+01 .17690E+01 .29645E+00 .94874E+00
.47688E+00 .17374E+00
NEW ABSOLUTE MINIMUM , PARAMETERS FOR FCN ENTRY 39 FOLLOW - - F,X(I)
-.8526438051E+03 .14016E+00 .10293E+01 .19809E+01 .65732E+00 .20038E+01 .17467E+01 .29394E+00 .94955E+00
.49316E+00 .10771E+00

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NEW ABSOLUTE MINIMUM . PARAMETERS FOR FCN ENTRY 41 FOLLOW - - F,X(I)
 -.5526442298E+03 .13853E+00 .10357E+01 .19692E+01 .65167E+00 -.19920E+01 .17615E+01 -.29233E+00 .94810E+00
 .60161E+00 .80867E-01

NEW ABSOLUTE MINIMUM . PARAMETERS FOR FCN ENTRY 43 FOLLOW - - F,X(I)
 -.5526443202E+03 .13801E+00 .10361E+01 .19669E+01 .65647E+00 -.19921E+01 .17653E+01 -.29080E+00 .94803E+00
 .60734E+00 .70697E-01

NEW ABSOLUTE MINIMUM . PARAMETERS FOR FCN ENTRY 45 FOLLOW - - F,X(I)
 -.5526443637E+03 .13812E+00 .10362E+01 .19671E+01 .65069E+00 -.19911E+01 .17644E+01 -.28930E+00 .94858E+00
 .61077E+00 .66772E-01

NEW ABSOLUTE MINIMUM . PARAMETERS FOR FCN ENTRY 47 FOLLOW - - F,X(I)
 -.5526443654E+03 .13819E+00 .10360E+01 .19666E+01 .65064E+00 -.19909E+01 .17645E+01 -.28977E+00 .94861E+00
 .61128E+00 .65803E-01

NEW ABSOLUTE MINIMUM . PARAMETERS FOR FCN ENTRY 48 FOLLOW - - F,X(I)
 -.5526443654E+03 .13818E+00 .10360E+01 .19665E+01 .65048E+00 -.19909E+01 .17645E+01 -.28983E+00 .94862E+00
 .61124E+00 .65909E-01

NEW ABSOLUTE MINIMUM . PARAMETERS FOR FCN ENTRY 49 FOLLOW - - F,X(I)
 -.5526443654E+03 .13818E+00 .10360E+01 .19666E+01 .65047E+00 -.19909E+01 .17645E+01 -.28981E+00 .94861E+00
 .61125E+00 .65852E-01

NEW ABSOLUTE MINIMUM . PARAMETERS FOR FCN ENTRY 50 FOLLOW - - F,X(I)
 -.5526443654E+03 .13818E+00 .10360E+01 .19665E+01 .65045E+00 -.19909E+01 .17645E+01 -.28982E+00 .94861E+00
 .61125E+00 .65861E-01

THE FUNCTION (FCN) HAS NOT IMPROVED BY .10000E-06 AFTER 3 STEPS WHICH INCLUDE A MINIMUM - - -

THEREFORE THE RUN HAS BEEN TERMINATED
 -.5526443654E+03 .13818E+00 .10360E+01 .19665E+01 .65045E+00 -.19909E+01 .17645E+01 -.28982E+00 .94861E+00
 .61125E+00 .65861E-01

ALL NUMBERS OF LAST ENTRY REFER TO FINAL PT. OF RUN

THE LOWEST VALUE OF THE FUNCTION (FCN) WAS -.5526443654E+03 FOR ENTRY 50 - - X(I) FOLLOWS
 .13818E+00 .10360E+01 .19665E+01 .65045E+00 -.19909E+01 .17645E+01 -.28982E+00 .94861E+00 .61125E+00 .65861E-01

RUN STATISTICS FOLLOW - -

NPCN= 50 NST= 19

MEAN (Y)

= 2.022502542603

	Y	E(Y)	Y-E(Y)
13	.2229E+01	.2202E+01	.2733E-01
14	.2174E+01	.2209E+01	-.3475E-01
15	.2051E+01	.2103E+01	-.5198E-01
16	.2358E+01	.2288E+01	.7054E-01
17	.2181E+01	.2167E+01	.1336E-01
18	.2242E+01	.2207E+01	.3459E-01
19	.2092E+01	.2077E+01	.1441E-01
20	.1990E+01	.1980E+01	.1062E-01
21	.1938E+01	.2027E+01	-.8941E-01
22	.1987E+01	.2019E+01	-.3277E-01
23	.2102E+01	.2105E+01	-.2269E-02
24	.2028E+01	.2069E+01	-.4086E-01
25	.2149E+01	.2166E+01	-.1620E-01
26	.2071E+01	.2078E+01	-.6732E-02
27	.2036E+01	.1980E+01	.5507E-01
28	.2168E+01	.2176E+01	-.7654E-02
29	.2136E+01	.2169E+01	-.3282E-01
30	.2116E+01	.2158E+01	-.4247E-01
31	.2050E+01	.2071E+01	-.2148E-01
32	.1912E+01	.1956E+01	-.4382E-01
33	.1897E+01	.1894E+01	.2784E-02
34	.2030E+01	.2010E+01	.1979E-01
35	.2135E+01	.2101E+01	.3466E-01
36	.2119E+01	.2016E+01	.1026E+00
37	.2227E+01	.2156E+01	.7114E-01
38	.2084E+01	.2051E+01	.3266E-01
39	.2113E+01	.2059E+01	.5362E-01
40	.2316E+01	.2275E+01	.4117E-01
41	.2097E+01	.2050E+01	.4660E-01
42	.2124E+01	.2120E+01	.4287E-02
43	.2059E+01	.2055E+01	.4185E-02
44	.1819E+01	.1846E+01	-.2703E-01
45	.1980E+01	.2005E+01	-.2416E-01
46	.1966E+01	.2006E+01	-.3944E-01
47	.2065E+01	.2025E+01	.4073E-01
48	.2106E+01	.2145E+01	-.3851E-01
49	.2160E+01	.2172E+01	-.1228E-01
50	.2086E+01	.2081E+01	.4828E-02
51	.1991E+01	.1985E+01	.5609E-02
52	.2256E+01	.2245E+01	.1150E-01
53	.2012E+01	.2069E+01	-.5632E-01
54	.2113E+01	.2149E+01	-.3631E-01
55	.2036E+01	.2037E+01	-.1803E-02
56	.1797E+01	.1821E+01	-.2358E-01
57	.1946E+01	.1945E+01	.1548E-02
58	.1930E+01	.1946E+01	-.1552E-01
59	.2079E+01	.2087E+01	-.7733E-02
60	.2117E+01	.2109E+01	.8285E-02
61	.2016E+01	.2101E+01	-.8533E-01
62	.2087E+01	.2124E+01	-.3736E-01
63	.1996E+01	.2013E+01	-.1699E-01
64	.2295E+01	.2273E+01	.2190E-01
65	.2008E+01	.2004E+01	.4392E-02
66	.2117E+01	.2130E+01	-.1237E-01
67	.1931E+01	.2019E+01	-.3823E-01
68	.1778E+01	.1801E+01	-.2299E-01
69	.1936E+01	.1982E+01	-.4668E-01

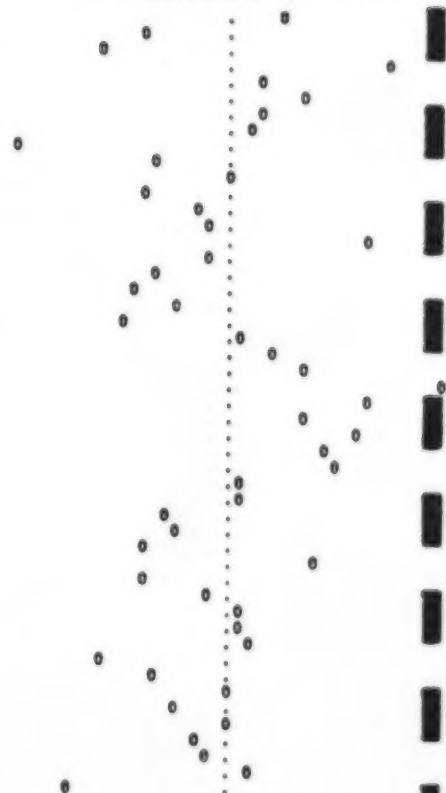
70	.1861E+01	.1868E+01	-.6713E-02
71	.2079E+01	.2076E+01	.2592E-02
72	.2117E+01	.2089E+01	.2755E-01
73	.1989E+01	.1995E+01	-.6020E-02
74	.2100E+01	.2041E+01	.5880E-01
75	.1942E+01	.1962E+01	-.1982E-01
76	.2161E+01	.2184E+01	-.2320E-01
77	.2017E+01	.2041E+01	-.2429E-01
78	.2076E+01	.2096E+01	-.1994E-01
79	.1893E+01	.1899E+01	-.5955E-02
80	.1844E+01	.1813E+01	.3160E-01
81	.1887E+01	.1877E+01	.1030E-01
82	.1905E+01	.1861E+01	.4340E-01
83	.2130E+01	.2085E+01	.4593E-01
84	.2026E+01	.2035E+01	-.9633E-02
85	.2059E+01	.2010E+01	.4904E-01
86	.2086E+01	.2075E+01	.1109E-01
87	.2027E+01	.1964E+01	.6241E-01
88	.2121E+01	.2071E+01	.4955E-01
89	.2084E+01	.2081E+01	.2672E-02
90	.2016E+01	.2044E+01	-.2771E-01
91	.2003E+01	.1997E+01	.6450E-02
92	.1860E+01	.1844E+01	.1584E-01
93	.1903E+01	.1917E+01	-.1400E-01
94	.1995E+01	.1990E+01	.4995E-02
95	.2126E+01	.2113E+01	.1262E-01
96	.2107E+01	.2048E+01	.5842E-01
97	.2154E+01	.2107E+01	.4782E-01
98	.2028E+01	.2046E+01	-.1810E-01
99	.1987E+01	.1981E+01	.5946E-02
100	.2144E+01	.2162E+01	-.1763E-01
101	.2114E+01	.2060E+01	.5431E-01
102	.2001E+01	.2011E+01	-.9173E-02
103	.9477E+00	.9428E+00	.4863E-02
104	.1785E+01	.1785E+01	-.7663E-03
105	.1836E+01	.1875E+01	-.3871E-01
106	.1889E+01	.1900E+01	-.1073E-01
107	.2006E+01	.2003E+01	.2399E-02
108	.2050E+01	.2081E+01	-.3073E-01
109	.1991E+01	.2056E+01	-.6506E-01
110	.1946E+01	.1911E+01	.3481E-01
111	.1825E+01	.1873E+01	-.4852E-01
112	.2074E+01	.2107E+01	-.3265E-01
113	.1920E+01	.1847E+01	.7257E-01
114	.1956E+01	.1994E+01	-.3817E-01
115	.1919E+01	.1930E+01	-.1100E-01
116	.1715E+01	.1664E+01	.5108E-01
117	.1907E+01	.1842E+01	.6546E-01
118	.1879E+01	.1928E+01	-.4903E-01
119	.2141E+01	.2111E+01	.2998E-01
120	.2264E+01	.2250E+01	.1333E-01
121	.2223E+01	.2271E+01	-.4805E-01
122	.2203E+01	.2250E+01	-.4637E-01
123	.1957E+01	.1949E+01	.8428E-02
124	.2247E+01	.2154E+01	.9275E-01
125	.2283E+01	.2230E+01	.5337E-01
126	.3029E+01	.3020E+01	.9026E-02
127	.2897E+01	.2928E+01	-.3108E-01
128	.2858E+01	.2829E+01	.2859E-01
129	.3111E+01	.3153E+01	-.4275E-01
130	.1811E+01	.1772E+01	.3911E-01
131	.9558E+00	.9366E+00	.1923E-01
132	.2107E+01	.2061E+01	.4534E-01
133	.2050E+01	.2032E+01	.1830E-01

134	.2021E+01	.2031E+01	-.9501E-02
135	.1910E+01	.1893E+01	.1732E-01
136	.2163E+01	.2149E+01	.1364E-01
137	.2014E+01	.2137E+01	-.1239E+00
138	.2180E+01	.2227E+01	-.4645E-01
139	.2021E+01	.2068E+01	-.4740E-01
140	.2037E+01	.2021E+01	.1533E-01
141	.2154E+01	.2124E+01	.3004E-01
142	.2081E+01	.2064E+01	.1683E-01
143	.2167E+01	.2121E+01	.4576E-01
144	.2081E+01	.2068E+01	.1359E-01
145	.2024E+01	.2050E+01	-.2586E-01
146	.2015E+01	.2035E+01	-.2079E-01
147	.1974E+01	.1908E+01	.6603E-01
148	.2072E+01	.2157E+01	-.8481E-01
149	.1847E+01	.1870E+01	-.2281E-01
150	.1930E+01	.1915E+01	.1557E-01
151	.1892E+01	.1832E+01	.6048E-01
152	.1856E+01	.1836E+01	.2029E-01
153	.1904E+01	.1959E+01	-.5516E-01
154	.1870E+01	.1883E+01	-.1257E-01
155	.1979E+01	.2008E+01	-.2854E-01
156	.1878E+01	.1891E+01	-.1292E-01
157	.1926E+01	.1936E+01	-.1085E-01
158	.1325E+01	.1898E+01	-.7370E-01
159	.1809E+01	.1813E+01	-.4283E-02
160	.1938E+01	.1902E+01	.3567E-01
161	.1921E+01	.1928E+01	-.7044E-02
162	.1840E+01	.1915E+01	-.7470E-01
163	.1869E+01	.1903E+01	-.3436E-01
164	.1765E+01	.1757E+01	.7864E-02
165	.1803E+01	.1790E+01	.1291E-01
166	.1847E+01	.1862E+01	-.1507E-01
167	.1902E+01	.1941E+01	-.3919E-01
168	.1894E+01	.1905E+01	-.1163E-01
169	.1992E+01	.2010E+01	-.1840E-01
170	.1839E+01	.1811E+01	.2777E-01
171	.1888E+01	.1816E+01	.7213E-01
172	.2103E+01	.2064E+01	.3860E-01
173	.1923E+01	.1913E+01	.1031E-01
174	.1882E+01	.1884E+01	-.2245E-02
175	.1896E+01	.1873E+01	.2275E-01
176	.1757E+01	.1756E+01	.1776E-02
177	.1842E+01	.1854E+01	-.1225E-01
178	.1844E+01	.1862E+01	-.1815E-01
179	.1923E+01	.1908E+01	.1531E-01
180	.2043E+01	.1977E+01	.6601E-01
181	.1954E+01	.2024E+01	-.6987E-01

MEAN (V**) = .05443714152325
 R2 (V**) = .9754921557983
 PSEUDO-(L)-R2 = .9717512726462
 ERROR VARIANCE = .000924141152182

	Y**	E(V**)	X**B	E(V**)-X**B	Y**-(V**)	Y**-(X**B)
13	.6994E-01	.4974E-01	.4974E-01	0.	.2020E-01	.2020E-01
14	.6533E-01	.9697E-01	.9697E-01	0.	-.3164E-01	-.3164E-01
15	.1813E-01	.6663E-01	.6663E-01	0.	-.4850E-01	-.4850E-01
16	.1288E+00	.6890E-01	.6890E-01	0.	-.5602E-01	-.5602E-01
17	.5758E-01	.4629E-01	.4629E-01	0.	.1129E-01	.1129E-01
18	.7457E-01	.4595E-01	.4595E-01	0.	.2862E-01	.2862E-01
19	.8616E-01	.7376E-01	.7376E-01	0.	.1240E-01	.1240E-01
20	.3080E-01	.2121E-01	.2121E-01	0.	.0959E-02	.0959E-02
21	-.5452E-01	.2441E-01	.2441E-01	0.	-.7893E-01	-.7893E-01
22	.4028E-02	.3143E-01	.3143E-01	0.	-.2740E-01	-.2740E-01
23	.1006E-01	.1189E-01	.1189E-01	0.	-.1833E-02	-.1833E-02
24	-.5220E-01	-.1986E-01	-.1986E-01	0.	-.3234E-01	-.3234E-01
25	.2922E-01	.4112E-01	.4112E-01	0.	-.1190E-01	-.1190E-01
26	.3605E-01	.4222E-01	.4222E-01	0.	-.6167E-02	-.6167E-02
27	.5480E-01	.4150E-02	.4150E-02	0.	.5065E-01	.5065E-01
28	-.1784E-01	-.1124E-01	-.1124E-01	0.	-.6595E-02	-.6595E-02
29	.5126E-01	.7907E-01	.7907E-01	0.	-.2781E-01	-.2781E-01
30	-.1100E-01	.2397E-01	.2397E-01	0.	-.3497E-01	-.3497E-01
31	.4246E-01	.6080E-01	.6080E-01	0.	-.1834E-01	-.1834E-01
32	.3864E-02	.4325E-01	.4325E-01	0.	-.3939E-01	-.3939E-01
33	.3903E-01	.3655E-01	.3655E-01	0.	.2481E-02	.2481E-02
34	.1066E+00	.9013E-01	.9013E-01	0.	.1844E-01	.1844E-01
35	.9872E-01	.7090E-01	.7090E-01	0.	.2782E-01	.2782E-01
36	.1329E+00	.5138E-01	.5138E-01	0.	.8149E-01	.8149E-01
37	.1265E+00	.7415E-01	.7415E-01	0.	.5235E-01	.5235E-01
38	.1157E+00	.8553E-01	.8553E-01	0.	.3017E-01	.3017E-01
39	.1594E+00	.1096E+00	.1096E+00	0.	.4978E-01	.4978E-01
40	.2283E+00	.1924E+00	.1924E+00	0.	.3592E-01	.3592E-01
41	.1868E-03	-.3835E-01	-.3835E-01	0.	.3854E-01	.3854E-01
42	.1005E+00	.9687E-01	.9687E-01	0.	.3585E-02	.3585E-02
43	.7885E-01	.7527E-01	.7527E-01	0.	.3580E-02	.3580E-02
44	-.1706E-01	.7505E-02	.7505E-02	0.	-.2456E-01	-.2456E-01
45	.1366E+00	.1576E+00	.1576E+00	0.	-.2101E-01	-.2101E-01
46	.1503E-01	.4749E-01	.4749E-01	0.	-.3246E-01	-.3246E-01
47	.5043E-01	.1730E-01	.1730E-01	0.	.3314E-01	.3314E-01
48	.6847E-01	.9890E-01	.9890E-01	0.	-.3044E-01	-.3044E-01
49	.2168E-01	.3058E-01	.3058E-01	0.	-.8895E-02	-.8895E-02
50	.8689E-01	.8253E-01	.8253E-01	0.	.4360E-02	.4360E-02
51	-.3368E-01	-.3881E-01	-.3881E-01	0.	.6127E-02	.6127E-02
52	.4231E-01	.3263E-01	.3263E-01	0.	.9684E-02	.9684E-02
53	.5704E-02	.5323E-01	.5323E-01	0.	-.4753E-01	-.4753E-01
54	.6030E-01	.8976E-01	.8976E-01	0.	-.2946E-01	-.2946E-01
55	.3598E-01	.3747E-01	.3747E-01	0.	-.1486E-02	-.1486E-02
56	-.7573E-02	.1281E-01	.1281E-01	0.	-.2038E-01	-.2038E-01
57	.4371E-01	.4239E-01	.4239E-01	0.	.1323E-02	.1323E-02
58	.3565E-01	.4836E-01	.4836E-01	0.	-.1271E-01	-.1271E-01
59	.9519E-01	.1014E+00	.1014E+00	0.	-.6225E-02	-.6225E-02
60	.6039E-01	.5401E-01	.5401E-01	0.	.6377E-02	.6377E-02
61	-.4377E-01	.1741E-01	.1741E-01	0.	-.6118E-01	-.6118E-01

PLOT OF RESIDUALS W = Y** - X**B



62	-.1647E+00	-.1379E+00	-.1379E+00	0.	-.3306E-01	-.3306E-01
63	-.7095E-01	-.8635E-01	-.8635E-01	0.	-.1540E-01	-.1540E-01
64	-.1222E+00	-.1042E+00	-.1042E+00	0.	-.1801E-01	-.1801E-01
65	-.1682E-01	-.1300E-01	-.1300E-01	0.	-.3615E-02	-.3615E-02
66	-.8810E-01	-.9807E-01	-.9807E-01	0.	-.9970E-02	-.9970E-02
67	-.2927E-02	-.3390E-01	-.3390E-01	0.	-.3097E-01	-.3097E-01
68	-.4318E-01	-.6347E-01	-.6347E-01	0.	-.2029E-01	-.2029E-01
69	-.4618E-01	-.8411E-01	-.8411E-01	0.	-.3793E-01	-.3793E-01
70	-.1331E-02	-.4079E-02	-.4079E-02	0.	-.5410E-02	-.5410E-02
71	-.7747E-01	-.7842E-01	-.7842E-01	0.	-.2050E-02	-.2050E-02
72	-.5462E-01	-.3397E-01	-.3397E-01	0.	-.2055E-02	-.2055E-02
73	-.2232E-01	-.2659E-01	-.2659E-01	0.	-.4267E-02	-.4267E-02
74	-.1851E+00	-.1302E+00	-.1302E+00	0.	-.8499E-01	-.8499E-01
75	-.1086E-01	-.6635E-02	-.6635E-02	0.	-.1749E-01	-.1749E-01
76	-.2524E-01	-.4452E-01	-.4452E-01	0.	-.1928E-01	-.1928E-01
77	-.3894E-01	-.5834E-01	-.5834E-01	0.	-.1940E-01	-.1940E-01
78	-.4561E-01	-.6147E-01	-.6147E-01	0.	-.1586E-01	-.1586E-01
79	-.3616E-03	-.4527E-02	-.4527E-02	0.	-.4888E-02	-.4888E-02
80	-.9359E-01	-.6636E-01	-.6636E-01	0.	-.2722E-01	-.2722E-01
81	-.2548E-01	-.1813E-01	-.1813E-01	0.	-.8344E-02	-.8344E-02
82	-.8527E-01	-.5057E-01	-.5057E-01	0.	-.3469E-01	-.3469E-01
83	-.1263E+00	-.9240E-01	-.9240E-01	0.	-.3589E-01	-.3589E-01
84	-.1043E-01	-.3300E-02	-.3300E-02	0.	-.7129E-02	-.7129E-02
85	-.8889E-01	-.5471E-01	-.5471E-01	0.	-.3418E-01	-.3418E-01
86	-.3136E-01	-.2187E-01	-.2187E-01	0.	-.9493E-02	-.9493E-02
87	-.1215E+00	-.6715E-01	-.6715E-01	0.	-.5431E-01	-.5431E-01
88	-.4599E-01	-.5373E-02	-.5373E-02	0.	-.4061E-01	-.4061E-01
89	-.1188E+00	-.1166E+00	-.1166E+00	0.	-.2166E-02	-.2166E-02
90	-.1608E-01	-.3790E-01	-.3790E-01	0.	-.2182E-01	-.2182E-01
91	-.1368E+00	-.1316E+00	-.1316E+00	0.	-.5254E-02	-.5254E-02
92	-.4419E-01	-.3091E-01	-.3091E-01	0.	-.1327E-01	-.1327E-01
93	-.8904E-01	-.1005E+00	-.1005E+00	0.	-.1151E-01	-.1151E-01
94	-.1205E+00	-.1166E+00	-.1166E+00	0.	-.3935E-02	-.3935E-02
95	-.5552E-01	-.4601E-01	-.4601E-01	0.	-.9510E-02	-.9510E-02
96	-.1137E+00	-.7045E-01	-.7045E-01	0.	-.4324E-01	-.4324E-01
97	-.1123E+00	-.7938E-01	-.7938E-01	0.	-.3295E-01	-.3295E-01
98	-.4903E-01	-.6448E-01	-.6448E-01	0.	-.1545E-01	-.1545E-01
99	-.5526E-01	-.5001E-01	-.5001E-01	0.	-.5246E-02	-.5246E-02
100	-.1031E+00	-.1175E+00	-.1175E+00	0.	-.1435E-01	-.1435E-01
101	-.6194E-01	-.1965E-01	-.1965E-01	0.	-.4229E-01	-.4229E-01
102	-.4745E-01	-.5466E-01	-.5466E-01	0.	-.7203E-02	-.7203E-02
103	-.7962E-01	-.8003E+00	-.8003E+00	1048-162	-.4081E-02	-.4081E-02
104	-.9532E-01	-.9594E-01	-.9594E-01	0.	-.6168E-03	-.6168E-03
105	-.2246E-01	-.5430E-01	-.5430E-01	0.	-.3184E-01	-.3184E-01
106	-.1376E-01	-.5479E-02	-.5479E-02	0.	-.8282E-02	-.8282E-02
107	-.3416E-02	-.1598E-02	-.1598E-02	0.	-.1818E-02	-.1818E-02
108	-.1487E-01					

ANALYSIS OF RESIDUALS

AUTOCORRELATION AND PARTIAL AUTOCORRELATION FUNCTIONS

N = 169

DIFFERENCE	LAGS	AUTOCORRELATIONS												STD-ERROR
														ROW
0 12 0 (1-B) (1-E) VAR = .841E-03	1-12	.20	.02	.03	.02	-.08	-.07	.03	.05	.11	-.01	.02	-.13	.08
	13-24	-.15	-.04	-.05	.03	-.06	-.09	.01	-.05	-.08	-.11	.04	-.03	.08
	25-36	-.03	-.18	-.03	.05	-.00	.01	.01	-.03	-.02	-.10	-.07	.02	.09
	37-48	.07	-.06	.05	.01	-.01	-.09	-.02	.13	.07	.13	.17	.07	.09
	49-60	-.02	-.01	-.01	-.01	-.01	.04	.05	.04	-.12	.03	-.00	.09	.10
1 12 0 (1-B) (1-E) VAR = .1274E-02	1-12	-.37	-.12	-.01	.07	-.07	-.06	.05	-.01	.11	-.09	.11	-.10	.08
	13-24	-.06	.06	-.04	.10	-.03	-.10	.11	-.02	.01	-.12	.12	-.03	.09
	25-36	-.10	-.19	.04	.08	-.03	.01	.02	-.04	.06	-.06	-.05	.03	.10
	37-48	.11	-.14	.09	.00	.03	-.10	-.06	.13	-.05	.00	.09	.00	.10
	49-60	-.06	.00	-.00	-.01	-.02	.02	.01	.10	-.20	.11	-.10	.12	.11
0 12 1 (1-B) (1-E) VAR = .102E-02	1-12	.24	.04	.01	-.01	-.03	.02	.03	.06	.12	.03	-.10	-.48	.08
	13-24	-.17	.06	-.02	.01	-.01	-.05	.00	-.08	-.11	-.03	.06	-.02	.09
	25-36	-.04	-.13	-.05	-.01	-.01	.08	.02	-.04	-.01	-.10	-.15	.02	.11
	37-48	.09	.01	.04	-.01	.00	-.10	-.03	.11	.14	.11	.15	-.01	.11
	49-60	-.04	.07	.03	.01	.07	.10	.03	-.01	-.16	-.00	.04	.11	.11
1 12 1 (1-E) (1-E) VAR = .150E-02	1-12	-.37	-.10	-.02	-.00	-.05	.03	-.02	-.01	.10	.02	.17	-.46	.08
	13-24	.06	.20	-.07	.04	.01	-.07	.09	-.03	-.07	-.02	.11	-.04	.05
	25-36	.05	-.11	.03	.02	-.05	.10	-.00	-.05	.06	-.02	-.14	.05	.11
	37-48	.10	-.06	.05	-.03	.07	-.12	-.04	.06	.05	-.05	.14	-.08	.12
	49-60	-.09	.09	-.01	-.06	.02	.07	-.01	.07	-.19	.07	-.03	.10	.12
DIFFERENCE	LAGS	PARTIAL AUTOCORRELATIONS												STD-ERROR
														ROW
0 12 0 (1-B) (1-E)	1-12	.20	-.02	.03	.01	-.09	-.04	.05	.04	.10	-.06	.02	-.16	.08
1 12 0 (1-B) (1-E)	1-12	-.37	-.30	-.23	-.10	-.14	-.19	-.14	-.16	.01	-.06	.11	.01	.08
0 12 1 (1-B) (1-E)	1-12	.24	-.01	.00	-.02	-.03	.03	.02	.05	.10	-.03	-.11	-.47	.08
1 12 1 (1-B) (1-E)	1-12	-.37	-.27	-.21	-.16	-.19	-.14	-.15	-.17	-.03	.05	.37	-.21	.08

PLOT OF RESIDUALS (ON HORIZONTAL AXIS) AGAINST SERIES SHOWF (ON VERTICAL AXIS)

RESIDUALS	SHOWF
15 -.48503E-01	.11300E+01
74 .54887E-01	.11312E+01
39 .49780E-01	.11537E+01
38 .30172E-01	.11785E+01
27 .50647E-01	.12062E+01
26 -.61672E-02	.12067E+01
14 -.31644E-01	.12285E+01
51 .51274E-02	.12468E+01
63 -.15400E-01	.12714E+01
44 -.24561E-01	.12821E+01
50 .43601E-02	.12961E+01
20 .95871E-02	.13046E+01
32 -.39390E-01	.13240E+01
62 -.33058E-01	.13828E+01
33 .24805E-02	.14045E+01
21 -.78933E-01	.14123E+01
75 -.17493E-01	.14146E+01
99 .52456E-02	.14305E+01
40 .35923E-01	.14381E+01
68 -.20285E-01	.14404E+01
135 .15138E-01	.14852E+01
45 -.21008E-01	.14926E+01
87 .54305E-01	.14930E+01
159 -.37300E-02	.14937E+01
28 -.65952E-02	.15127E+01
19 .12405E-01	.15456E+01
147 .56998E-01	.15475E+01
56 -.20380E-01	.15563E+01
111 -.41836E-01	.15654E+01
80 .27223E-01	.15800E+01
86 .94932E-02	.15831E+01
31 -.18344E-01	.15877E+01
16 .59875E-01	.15926E+01
98 -.15448E-01	.15934E+01
134 -.80988E-02	.15987E+01
43 .35796E-02	.16038E+01
171 .61820E-01	.16048E+01
123 .72012E-02	.16167E+01
29 -.27812E-01	.16229E+01
110 .29612E-01	.16390E+01
17 .11294E-01	.16419E+01
52 .96838E-02	.16569E+01
170 .23608E-01	.16618E+01
53 -.47527E-01	.16664E+01
57 .13229E-02	.16690E+01
22 -.27399E-01	.17314E+01
42 .35853E-02	.17354E+01
158 -.61761E-01	.17427E+01
76 -.19276E-01	.17433E+01
146 -.17334E-01	.17453E+01
92 .13272E-01	.17526E+01
55 -.14857E-02	.17682E+01
18 .28620E-01	.17712E+01
34 .16441E-01	.17791E+01
41 .38540E-01	.17966E+01
64 .18005E-01	.18054E+01
30 -.34969E-01	.18123E+01
122 -.37956E-01	.18380E+01
46 -.32458E-01	.18409E+01



88	.40606E-01	.18562E+01
79	-.48885E-02	.18573E+01
93	-.11511E-01	.18574E+01
104	-.61685E-03	.18653E+01
65	.36151E-02	.18657E+01
105	-.31840E-01	.18685E+01
58	-.12711E-01	.18784E+01
100	-.14349E-01	.18849E+01
23	-.18331E-02	.19030E+01
54	-.29462E-01	.19158E+01
47	.33135E-01	.19170E+01
140	.12473E-01	.19248E+01
116	.41913E-01	.19257E+01
91	.52542E-02	.19317E+01
89	-.37930E-01	.19368E+01
172	.31276E-01	.19404E+01
67	-.30969E-01	.19507E+01
152	.16525E-01	.19513E+01
66	-.99699E-02	.19608E+01
59	-.62253E-02	.19683E+01
89	.21658E-02	.19777E+01
160	.28836E-01	.19881E+01
81	.83443E-02	.19920E+01
70	-.54103E-02	.19977E+01
35	.27820E-01	.20027E+01
165	.10449E-01	.20148E+01
164	.63604E-02	.20326E+01
103	.40806E-02	.20334E+01
77	-.19400E-01	.20481E+01
128	.22425E-01	.20639E+01
136	.10861E-01	.20645E+01
153	-.44078E-01	.20669E+01
78	-.15865E-01	.20680E+01
112	-.25964E-01	.20720E+01
82	.34694E-01	.20794E+01
148	-.67305E-01	.20854E+01
36	.81486E-01	.20930E+01
48	-.30437E-01	.21135E+01
24	-.32338E-01	.21172E+01
177	-.97117E-02	.21401E+01
161	-.55643E-02	.21405E+01
90	-.21821E-01	.21596E+01
141	.23619E-01	.21602E+01
117	.51743E-01	.21700E+01
71	.20502E-02	.21740E+01
102	-.72030E-02	.21767E+01
94	.39346E-02	.21997E+01
142	.13187E-01	.22043E+01
83	.35893E-01	.22144E+01
176	.14153E-02	.22247E+01
137	-.96697E-01	.22249E+01
139	-.36930E-01	.22458E+01
149	-.17848E-01	.22469E+01
101	-.42290E-01	.22472E+01
114	-.29657E-01	.22823E+01
129	-.32397E-01	.22955E+01
154	-.97617E-02	.23026E+01
186	-.11685E-01	.23207E+01
124	.71245E-01	.23392E+01
106	-.82819E-02	.23434E+01
151	.46793E-01	.23531E+01
60	.63770E-02	.23568E+01
115	-.84740E-02	.23586E+01
138	-.35531E-01	.23701E+01



143	.35042E-01	.23797E+01
125	.40629E-01	.24078E+01
113	.65749E-01	.24100E+01
127	-.23319E-01	.24155E+01
126	.67409E-02	.24544E+01
173	.78781E-02	.24672E+01
162	-.66970E-01	.24711E+01
178	-.13790E-01	.25062E+01
150	.11802E-01	.25322E+01
95	.95096E-02	.25430E+01
167	-.29526E-01	.25711E+01
107	.18180E-02	.25782E+01
175	.17162E-01	.25829E+01
72	.20645E-01	.25895E+01
131	.15013E-01	.26027E+01
174	-.16716E-02	.26072E+01
179	.11493E-01	.26266E+01
119	.22293E-01	.26574E+01
130	.29317E-01	.26646E+01
163	-.25631E-01	.26739E+01
13	.20200E-01	.26985E+01
84	-.71289E-02	.27019E+01
96	.43239E-01	.27128E+01
155	-.21111E-01	.27309E+01
118	-.36358E-01	.27312E+01
37	.62352E-01	.27426E+01
25	-.11900E-01	.27543E+01
168	-.85363E-02	.28169E+01
156	-.94787E-02	.28301E+01
49	-.88947E-02	.28900E+01
144	.98128E-02	.29800E+01
108	-.22035E-01	.30379E+01
61	-.61182E-01	.30450E+01
73	-.42667E-02	.31561E+01
180	.46783E-01	.31972E+01
120	.93883E-02	.32120E+01
85	.34180E-01	.33904E+01
132	.31337E-01	.34782E+01
97	.32953E-01	.35007E+01
145	-.17717E-01	.35893E+01
109	-.44362E-01	.36612E+01
157	-.71740E-02	.40897E+01
133	.12055E-01	.41631E+01
121	-.31260E-01	.42450E+01
169	-.11940E-01	.43585E+01
181	-.44842E-01	.45578E+01



CORRELATION MATRIX

EX8	1.0000												
EX9	-.4570	1.0000											
EX0	-.0001	-.4909	1.0000										
EX1	-.0017	-.0014	-.6505	1.0000									
STR	-.0806	-.0001	-.0001	-.0012	1.0000								
ZA	.0001	.0000	.0000	.0006	.0940	1.0000							
WD	.0359	-.0080	.0246	.0020	-.0153	.0650	1.0000						
SAT	.0609	-.0207	.0124	-.0136	-.0201	.0746	-.3746	1.0000					
SHD	.0170	.0564	-.0161	-.0175	.0224	.0818	-.6065	.1344	1.0000				
ANT	-.0001	-.0001	-.0001	-.0007	-.0000	.1700	.1675	.0139	-.1760	1.0000			
ANTL1	-.0001	-.0001	-.0001	-.0007	-.0000	.1829	-.0612	-.0939	.1132	-.0847	1.0000		
XCANFA	-.1626	-.0068	-.0288	.0034	-.6005	-.0283	.1432	-.0721	-.1655	.0198	.0359	1.0000	
EX8	EX9	EX0	EX1	STR	ZA	WD	SAT	SHD	ANT	ANTL1	XCANFA		

LIKELIHOOD RATIO TEST $(-2\log(L_0/L_1)) = .0992860E+02$

FINAL VALUES OF THE PARAMETERS		GRADIENT	STANDARD ERRORS	STUDENT-T	ELASTICITIES
1 FAD	-.1206867E+02	.1376975E-08	.1744147E+02	-.6919827E+00	-.1818832E+00
2 NC	-.8068309E-01	-.3084786E-07	.8974707E-01	-.8990052E+00	-.3922560E+00
3 P	.1910673E+00	-.2583562E-08	.3203337E+00	.5964631E+00	.1915296E+00
4 RAVEN	.3220468E+00	-.1606224E-07	.1131127E+01	.2847132E+00	.6768794E+00
5 TW	-.3640797E+00	-.1555122E-08	.1384022E+01	-.2630592E+00	-.1172485E-01
6 TT	-.5118951E+01	-.1118643E-08	.5201839E+01	-.9840656E+00	-.8769970E+00
7 T2T	.3289757E+00	-.4584422E-10	.3851542E+00	.8541404E+00	.1698958E+00
8 TLK	-.1511554E-02	-.6910781E-08	.7911761E-02	-.1910515E+00	-.1446976E-02
9 RFK	-.2349675E-01	-.1132662E-08	.8813750E-02	-.2663920E+01	-.9281837E-02
10 SFK	.5146613E-03	-.1625131E-07	.1145631E-02	.4492382E+00	.6844850E-03
11 CSFMR	.2855947E-02	-.1349059E-07	.2334025E-02	.1223616E+01	.3511802E-02
12 EAMFP	.3548787E+00	-.2316085E-09	.8820882E-01	.4023166E+01	.2639826E+00
13 RCUTP	-.1240169E-02	-.1420926E-07	.1176428E-01	-.1054182E+00	-.1441526E-02
14 SHONF	.2290042E-01	-.4520643E-08	.3039388E-01	.7534542E+00	.4451591E-01
15 EX7	.2485318E+00	.2290903E-08	.3622135E-01	.6861474E+01	.1329427E-01
16 EX8	.1902208E-01	-.5210495E-08	.5743231E-02	.3312087E+01	.2292655E-02
17 EX9	.1115348E-01	.7480594E-10	.7219206E-02	.1544973E+01	.7758907E-03
18 EX0	-.2292642E-02	-.6376695E-09	.1118728E-01	-.2049328E+00	-.1380466E-03
19 EX1	-.3344425E-02	-.3190706E-08	.1857693E-01	-.1800311E+00	-.1799954E-03
20 STR	-.7148347E+00	-.9549694E-10	.6313917E-01	-.1132157E+02	-.9202006E-02
21 ZA	.8674004E-01	-.2269473E-09	.2219362E-01	.3908331E+01	.2001316E-01
22 WD	.1630322E+01	-.1872969E-08	.1319630E+01	.1235439E+01	.6757507E+00
23 SAT	.2673972E+00	-.3749079E-08	.4463336E+00	.5990972E+00	.8956497E-01
24 SHD	.2540578E+00	-.4023065E-08	.4584432E+00	.5541751E+00	.8044825E-01
25 ANT	-.8531776E-01	-.5377387E-10	.4786368E-01	-.1782516E+01	-.2498110E-03
26 ANTL1	.4433630E-01	.2546585E-10	.2925272E-01	.1515630E+01	.1297130E-03
27 CONSTANT	-.5882365E+01	-.3119666E-08	.6678126E+01	-.8808406E+00	-.3015651E+01
28 RHO 1	.1373114E+00	-.2724061E-06	.7467046E-01	.1838898E+01	
29 RHO 12	.7763176E+00	-.2041543E-04	.7359412E-01	.1054864E+02	
30 LAMBDA(X) 1	.1966544E+01	-.2399645E-05	.8311535E+00	.2366042E+01	
					.1162895E+01
31 LAMBDA(X) 2	.6504478E+00	-.1091755E-04	.1602829E+01	.4058123E+00	-.2180845E+00
32 LAMBDA(X) 3	-.1990902E+01	.1692943E-05	.1246724E+01	-.1596906E+01	-.2399008E+01
33 LAMBDA(X) 4	.1764537E+01	-.7535144E-07	.1049292E+01	.1681646E+01	.7286219E+00
34 LAMBDA(X) 5	-.2898168E+00	.3412946E-07	.1150496E+01	-.2519060E+00	-.1121097E+01
35 LAMBDA(Y)	.9486146E+00	.4078888E-05	.1550364E+00	.8118658E+01	-.3314409E+00
36 DELTA 1	.5112492E+00	-.3219621E-04	.1655167E+01	.3088577E+00	
37 LAMBDA(E) 1	.6586076E-01	-.1207568E-04	.4644681E+01	.1417982E-01	-.2011202E+00

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